CLAIMS

[Claim(s)]
[Claim 1] It is a call about the mobile station of undecided data transmission. C/I of the forward direction link signal from at least one base station is measured. The base station chosen based on the parameter of lot is chosen. Said selected base station is identified. It is delivery about a data demand message to said selected base station. The approach of the high-speed packet data transmission from at least one base station containing the step which transmits data by the data rate which followed said data demand message from said selected base station to a mobile station.
[Claim 2] Said step identified [measures, chooses and] and sent is the approach of claim 1 performed by each time amount slot until said data transmission is completed.
[Claim 3] The approach of claim 1 performed by taking into consideration the received value said whose step to measure is the activity bit of the forward direction.
[Claim 4] The approach of claim 1 performed with the forward direction link pilot signal from all the base stations that have said step to measure in the active group of said mobile station.
[Claim 5] The approach of claim 4 that an additional base station will be added to said active group of said mobile station if the transmission power of an additional base station exceeds the threshold of a schedule.
[Claim 6] The approach of claim 1 that said step to choose is based on C/I of said forward direction link signal.
[Claim 7] The approach of claim 1 that said step to choose is based on current [of said forward direction link signal], and C/front I.
[Claim 8] The approach of claim 1 that said step to choose is performed according to the hysteresis of a schedule.
[Claim 9] The approach of claim 8 that the hysteresis of said schedule is a hysteresis which set the foundation to time amount.
[Claim 10] The approach of claim 8 that the hysteresis of said schedule is a hysteresis which set the foundation on level.
[Claim 11] The approach of claim 1 performed by covering said data demand message in Walsh code to which said step to send supports said selected base station.
[Claim 12] The approach of claim 11 that said Walsh code is die-length 128 chip.
[Claim 13] The approach of claim 1 which is the display of the data rate as which said data demand message was required.
[Claim 14] The approach of claim 13 that said demanded data rate is one of the data rates in which two or more support is possible.
[Claim 15] The data rate in which said support is possible is the approach of claim 14 chosen according to the cumulative distribution function of C/I in the cel in which said mobile station and said selected base station exist.
[Claim 16] The approach of claim 1 that said data demand message is the display of the quality of a transmission link.

[Claim 17] The approach of claim 1 that said data demand message occupies a part with an early time amount slot.
[Claim 18] The approach of claim 1 that the schedule of said step to transmit is carried out by the scheduler based on precedence of said mobile station.
[Claim 19] The approach of claim 1 that said step to transmit is in each time amount slot from at most one of said the at least one base station.
[Claim 20] The approach of claim 1 which said selected base station transmits to one mobile station by each time amount slot.
[Claim 21] The approach of claim 1 transmitted by available transmission power with said selected base station near said selected max of a base station or selected it.
[Claim 22] The approach of claim 1 that said step to transmit is performed using the rectangular Walsh channel.
[Claim 23] The approach of claim 22 which has the data rate to which each rectangular Walsh channel was fixed.
[Claim 24] The approach of claim 1 that said step to transmit is performed using a quadrature-phase Shift-key.
[Claim 25] The approach of claim 1 that said step to transmit is performed using right-angle amplitude modulation.
[Claim 26] The approach of claim 1 that said step to transmit is performed using a directional beam.
[Claim 27] The approach of claim 1 that said data are transmitted to said mobile station by the data packet.
[Claim 28] The approach of claim 27 that said data packet is the size fixed about all data rates.
[Claim 29] The approach of claim 27 that said data packet is transmitted [one or the time amount slot beyond it].
[Claim 30] The approach of claim 27 that each data packet contains a preamble.
[Claim 31] The approach of claim 30 which said preamble diffuses in a long PN code.
[Claim 32] The approach of claim 30 that the die length of said preamble is based on said data rate.
[Claim 33] The approach of claim 27 that each data unit is identified for each data packet with the number of sequences including a data unit.
[Claim 34] The approach of claim 33 which contains further the step which transmits a negative-acknowledge (NACK) message for the data unit which was not received by said mobile station.
[Claim 35] The approach of claim 34 which contains further the step which re-transmits said data unit which was not received by said mobile station according to said NACK message.
[Claim 36] The approach of claim 1 which contains further the step which sends data to all the base stations in the active group of said mobile station.
[Claim 37] The approach of claim 36 transmitted based on the predictive decision of the data with which said selected base station remains.
[Claim 38] A pilot signal is transmitted to the 1st from each of at least one base station. C/I of said pilot signal from said at least one base station is measured. The base station chosen based on the parameter of lot is chosen. Said selected base station is identified. A data demand message to said selected base station Delivery, The approach of the high-speed packet data transmission from at least one base station in the CDMA communication system containing the step which transmits data to the 2nd by the data rate which followed said data demand message from said selected base station to a mobile station.
[Claim 39] Said step identified [measures, chooses and] and sent is the approach of claim 38 performed by each time amount slot until said data transmission is completed.
[Claim 40] The approach of claim 38 performed by covering said data demand message in Walsh code to which said step to send supports said selected base station.
[Claim 41] The approach of claim 38 which is the display of the data rate as which said data demand message was required.
[Claim 42] The approach of claim 38 that said data demand message is the display of the quality of a transmission link.

[Claim 43] The approach of claim 38 which said selected base station transmits to one mobile station by each time amount slot.
[Claim 44] The approach of claim 38 transmitted by available transmission power with said selected base station near said selected max of a base station or selected it.
[Claim 45] The approach of claim 38 that data are transmitted to said mobile station by the data packet, and said data packet is transmitted [one or the time amount slot beyond it].
[Claim 46] The approach of claim 45 that each data unit is identified for each data packet with the number of sequences including a data unit.
[Claim 47] The approach of claim 46 which contains further the step which transmits a negative-acknowledge (NACK) message for the data unit which was not received by said mobile station.
[Claim 48] The approach of claim 47 which contains further the step which re-transmits said data unit which was not received by said mobile station according to said NACK message.
[Claim 49] At least one base station which transmits the call message within a forward direction link signal to a mobile station respectively An inner transmitter, The receiver of said one mobile office which receives said call message and performs C / I measurement of said forward direction link signal from the transmitter in said at least one base station, At least one mobile station which is connected to said receiver in order to receive said C/I measurement, and identifies the selected base station respectively An inner controller, The transmitter of said mobile office connected to said controller in order to transmit data demand message is included. Equipment of the high-speed packet data transmission from at least one base station to the mobile station which transmits data by the data rate to which said transmitter in said selected base station followed said data demand message.
[Claim 50] Equipment of claim 49 with which said receiver performs said C/I measurement by each time amount slot, said controller identifies said selected base station by each time amount slot, and said transmitter of said mobile office transmits said data demand message to each time amount slot.
[Claim 51] Equipment of claim 49 which performs said C/I measurement when said receiver takes into consideration the value with which the forward direction activity bit was received.
[Claim 52] Equipment of claim 49 which contains further the Walsh covering element which covers said data demand message in Walsh code to which said transmitter of said mobile office supports said selected base station.
[Claim 53] Equipment of claim 49 with which said at least one base station includes the queue of stored data further.
[Claim 54] It is delivery about the demand of one high transmission of the data rate in which two or more support of a hard flow link signal is possible. The demand of said high transmission is received and permitted. It is delivery to said mobile station about said authorization. The approach of the high-speed packet data transmission from the mobile station containing the step which transmits data by one of the data rates in which said two or more support is possible to at least one base station.
[Claim 55] The approach of claim 54 that said mobile station transmits data by the data rate low without the authorization from said at least one base station.
[Claim 56] The encoder encoded to the packet which the data packet was received [packet] and had said data packet encoded, The frame blowout tea element which carries out the blowout tea of said a part of encoded packet in order to supply the packet by which received said encoded packet and blowout tea was carried out, The rate controller of adjustable which is connected to said frame blowout tea element, receives said packet by which blowout tea was carried out, and multiplexes said packet by which blowout tea was carried out to a concurrency channel, The Walsh covering element which covers said concurrency channel with Walsh covering in order to connect with said rate controller of adjustable, to receive said concurrency channel and to supply a rectangular channel, Transmitter of the high-speed packet data transmission containing the gain element which carries out scale doubling of said rectangular channel in order to supply the channel by which was connected to said Walsh covering element, and received said rectangular channel, and scale doubling was carried out.
[Claim 57] The transmitter of claim 56 with which each of said concurrency channel has a rate of fixed data.

[Claim 58] The transmitter of claim 56 which contains further the multiplexer which multiplexes the pilot wave who has said channel by which scale doubling was carried out in order to connect with said gain element and to supply the Walsh channel, and a power control burst.
[Claim 59] The transmitter of claim 58 with which said pilot wave and a power control burst are put on the location where it was fixed within each time amount slot.
[Claim 60] The transmitter of claim 58 with which said pilot wave and a power control burst are supplied to two locations in each time amount slot.
[Claim 61] The transmitter of claim 56 which contains further the multiplexer which multiplexes the preamble which has said channel by which scale doubling was carried out in order to connect with said gain element and to supply the Walsh channel.
[Claim 62] The transmitter of claim 56 which contains further the scrambling machine which is inserted between said frame blowout tea element and said rate controller of adjustable, stirs said packet by which blowout tea was carried out, and is stirred by the sequence.
[Claim 63] The transmitter of claim 56 whose each of said Walsh covering is die length of 16 bits.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
Field of background I. invention of invention This invention relates to data communication. In addition, especially this invention relates to new, the improved approach, and equipment of high packet data transmission.
Description of II. related technique It is required that today's communication system should support applied versatility. one of the communication system of these is a code division multiple access (CDMA) system which is referred to as a below "TIA/EIA [of double mode broadband spectrum diffusion cellular system] / IS-95 mobile station-base station compatibility criterion" IS-95 criterion and which is alike and suits. A CDMA system permits the voice and data communication between users by the ground link. Both use of the CDMA technique in point-to-multipoint connection communication system is indicated by U.S. patent No.4,901,307 entitled "the spread-spectrum-multiple-access communication system which uses a satellite or a ground repeater" which was transferred to the grantee of this invention and incorporated here as bibliography, and U.S. patent No.5,103,459 which are entitled "the system of wave generating and approach" in a CDMA cellular phone system.
[0002]
In this specification, a base station is interpreted as the hardware with which a mobile station communicates. A cel is interpreted as the covering field on hardware or geography depending on the context for which the vocabulary is used. A sector is the partition of a cel. Since the sector of a CDMA system has the attribute of a cel, the instruction described by the vocabulary of a cel is extended that there is no difficulty in a sector.
[0003]
In a CDMA system, the communication link between users is told through one or the base station beyond it. the 1st user of one mobile station transmits data to a base station by the hard flow link -- the -- it communicates with the 2nd user of 2 mobile station. A base station can receive data and can send data to other base stations. the forward direction link of the base station where data are the same, or the 2nd base station -- the -- it is transmitted to 2 mobile station. A forward direction link means transmission to a mobile station from a base station, and a hard flow link means transmission to a base station from a mobile station. In an IS-95 system, a forward direction link and a hard flow link can assign a separate frequency.
[0004]
A mobile station communicates with at least one base station during a communication link. A CDMA mobile office can communicate to the base station and coincidence of the number of software hand off Nakata. A software hand off is a process which establishes a new base station and a new link, before cutting a previous base station and a previous link. A software hand off makes possibility of the dropped call the minimum. The approach and system which offer a mobile station and a communication link through one or more base stations among a software hand off process are indicated by U.S. patent No.5,267,261 entitled "the mobile assistance software hand off in a CDMA cellular phone system"

which was transferred to the grantee of this invention and incorporated here as bibliography. A software hand off is a process from which a communication link arises exceeding the plural sectors served by the same base station by it. The process of a software hand off is described by the detail U.S. patent application No.08/763,498 under continuation which was transferred to the grantee of this invention and incorporated here as bibliography and which is entitled "the method of performing a hand off between the sectors of a common base station and equipment" for which it applied on December 11, 1996.

[0005]

The need very for a high rate wireless data telecommunication system has increased importance for the need to which wireless data application was given and which is growing. An IS-95 criterion can transmit traffic data and voice data by the forward direction and the hard flow link. The method of transmitting traffic data to the code channel frame of the fixed size is described by the detail U.S. patent No.5,504,773 entitled "the approach and equipment" of format-izing of data for transmission which were transferred to the grantee of this invention and incorporated here as bibliography. Traffic data and voice data are classified into the code channel frame which is 20msec width of face in the data rate of 14.4Kbps height according to an IS-95 criterion.

[0006]

I hear that the former imposes strict and the fixed delay demand, and the important difference between voice service and data service has it. Typically, the delay of the whole one way of a conversation frame is indispensable at 100 or less msecs. Symmetrically, data delay can become the adjustable parameter used so that the effectiveness of a data telecommunication system may be optimized. An efficient error correcting code-ized technique may be used rather than it requires suggestive more larger delay than the delay which may be especially treated generously by voice service. data -- instantiation ---like -- being efficient -- coding -- an outline -- this invention -- a grantee -- transferring -- having -- and -- here -- bibliography -- ****** -- incorporating -- having had -- 1996 -- a year -- 11 -- a month -- six -- a day -- applying -- having had -- " -- winding ---like -- coding -- having had -- a code -- a word -- decoding -- software -- decision -- an output -- a decoder -- " -- ** -- entitling -- U . -- S . -- patent application -- No . -- 08 -- /-- 743,688 -- describing -- having .

[0007]

Other important differences between voice service and data service are the former's being fixed for all users and requiring extent (GOS) of common service. Typically, for the digital system which offers voice service, it is fixed about all users and this hooks up to the maximum allowed value about an equal baud transmission rate and the error rate of a conversation frame. Symmetrically, for data service, GOS can differ from a user to a user, and since it increases the effectiveness of the whole data telecommunication system, parameter optimization of it may be carried out. GOS of a data telecommunication system is typically defined as all delay increased by transmission of the amount of data of a schedule, and is henceforth quoted as a data packet.

[0008]

One important difference which will accept it between voice service and data service is requiring the reliable communication link where the former's is offered by the software hand off in instantiation-CDMA communication system. Since a software hand off increases dependability, it brings about transmission which overlapped from the base station beyond two or it. However, since the data packet received by the error is re-transmitted, this additional dependability is not required for data transmission. For data service, since the transmission power used in order to support a software hand off transmits additional data, it may be used efficiently.

[0009]

The parameter which measures the quality and effectiveness of a data telecommunication system is the rate of an average throughput of the transmission lag and system which are demanded in order to transmit a data packet. A transmission lag does not have the same impact in data communication so that it may carry out for voice communication, but in order to measure the quality of a data telecommunication system, it is important measuring. The rate of an average throughput is the measure of the effectiveness of the data transmission capacity of communication system.

[0010]
It is known well that a user's signal pair noise and active jamming ratio C/I to which arbitration was given in cellular system are the function of a user's location in a covering field. In order to maintain the level of the given service, it depends for TDMA and an FDMA system on a frequency reuse technique, namely, the frequency channel and/or time slot which are not all are used in each base station. In a CDMA system, the reuse of the same frequency assignment was carried out to each cel of a system, and, thereby, it has improved the whole effectiveness. C/I which the mobile station of the user by whom arbitration was given attains determines the information rate which may be supported from a base station to a user's mobile station for the link of this specification. If there are the specific modulation and the specific error correction approach which are used for transmission whose this invention searches for maximization of data transmission, the level to which the engine performance was given is attained on the level which C/I supports. Distribution of C/I attained within an ideal cel for the ideal cellular system which had the cell layout of six square shapes and uses the common frequency for each cel may be calculated.

[0011]
C/I attained by the user by whom arbitration was given is the function of path loss, it increases as r3 to r5 about ground cellular system, and r is the distance to the radiation source here. Path loss tends to receive a random change according to the artifact or the natural obstruction within the path of a radio wave for being carried out. These random change is typically used as a model as a shadowing random process of log normal distribution which has the standard deviation of 8dB. The shadowing process which has the C/I distribution as a result attained with the total direction base station antenna for ideal 6 square-shape cellular layout, r4 propagation principle, and the standard deviation of 8dB is shown in drawing 18.

[0012]
A mobile station will be supplied by the best base station defined having attained the unrelated largest C/I value in the physical distance to each base station supposing the acquired C/I distribution may be attained only in the location of the moment of the arbitration of time amount, and arbitration. As mentioned above, the minimum physical distance of the signal which has the largest C/I value may be others from a mobile station because of the random special feature of path loss. If it is communicating symmetrically only by a mobile station's passing through the base station of the minimum distance, C/I may descend substantially. so, the best supply base station which has attained the maximum C/I value to all time amount for a mobile station -- and -- since -- communicating is advantageous. As the model by which idealization was carried out [above-mentioned] was shown in drawing 18, it may be observed again that the range of the value of attained C/I may be the magnitude as 10,000 with the same difference between the highest and the minimum value. In actual activation, the range is typically restricted to abbreviation 1:100 or 20dB. so, the thing for which only the multiplier of 100 is supplied to a mobile station at the rate of an information bit which can change since the following relation is maintained for a CDMA base station -- possible -- : -- [Equation 1]

$$R_b = W\frac{(C/I)}{(E_b/I_o)}, \qquad (1)$$

Rb expresses the information rate to a specific mobile station here, and W is a spectrum diffusion signal.

It is the total bandwidth which is alike and is occupied more, and Eb/Io is the energy exceeding the active jamming consistency demanded in order to attain the level to which the engine performance was given for every bit. As an example, the bandwidth W whose spectrum diffusion signal is 1.2288MHz is occupied, and if the communication link which can trust it requires average Eb/Io equal to 3dB, the mobile office which attains the C/I value of 3dB in the best base station can communicate by the data rate of the same height as 1.2288Mbps(es). If another side is also carried out, active jamming with a mobile office substantial from an adjoining base station is received and only -7dB C/I can be attained, a reliable communication link cannot be supported at a larger rate than 122.88Kbps(es). The communication system designed in order to make an average throughput into max will try to supply each remote user by the highest data rate Rb that a remote user trusts and can so be supported from the best supply base station. The data telecommunication system of this invention uses the description quoted upwards, and makes a data throughput max from a CDMA base station to a mobile station.

[0013]

Outline of invention This invention is new, the improved approach, and equipment of the high packet data transmission in a CDMA system. This invention improves the effectiveness of a CDMA system by offering the means of the data transmission of the forward direction and a hard flow link. Each mobile station communicates with one or the base station beyond it, and supervises a control channel for continuation of the communication link with a base station. Since a control channel transmits the small quantity of the data which are the paging message by which the address was carried out to the specific mobile office, it can be used by the base station, and it broadcasts a message to all mobile offices. It notifies to a mobile station that a paging message has a lot of data for a base station to transmit to a mobile station.

[0014]

The purpose of this invention is to improve use of the forward direction and hard flow link capacity in a data telecommunication system. By reception of one or the paging message from the base station beyond it, a mobile office measures the signal pair noise and active jamming ratio (C/I) of a forward direction link signal (for example, forward direction link pilot signal) for every time amount slot, and chooses the best base station which is using the parameter of the lot which may include C/I measurement of the present and a front. In an instantiation-example, a mobile office is transmitted to the base station chosen on the data demand (DRC) channel which was able to leave the demand of transmission by the highest data rate which measured C/I can trust and support for every time amount slot. The selected base station is the data rate which does not exceed the data rate received from the mobile station, and transmits the data of a data packet on a DRC channel. The throughput and transmission lag which were improved are attained for every time amount slot by transmission from the best base station.

[0015]

Other purposes of this invention are by transmitting to a mobile station by the data rate demanded by the mobile station from the base station chosen by peak transmission power for continuation of one or the time amount slot beyond it to improve the engine performance. In instantiation-CDMA communication system, a base station is operated by the back off (for example, 3dB) of a schedule from available transmission power for the reason of the change in a usage. In this way, average transmission power is the one half of peak power. However, in this invention, since high-speed-data transmission is planned and power is not divided typically (being for example, between transmissions), it does not need to carry out the back off from available peak transmission power.

[0016]

Other purposes of this invention are by permitting that a base station transmits a data packet to each mobile station as a good variable of a time amount slot to raise effectiveness. The capacity transmitted from a base station which is different from a time amount slot to a time amount slot permits that the data telecommunication system of this invention is promptly adapted for the change in an operating environment. In addition, since the capacity to transmit a data packet [the time amount slot not adjoining] checks the data unit in a data packet, it is possible in this invention by use of the number of sequences.

[0017]
Other purposes of this invention are by transmitting the data packet by which the address was carried out to the specific mobile station from a CC machine to all the base stations that are the members of the active group of a mobile station to increase flexibility. In this invention, data transmission may happen from the base station of the arbitration in the active group of a mobile station by each time amount slot. Since each base station includes the queue containing the data which should be transmitted to a mobile station, efficient forward direction link transmission may take place by the minimum processing delay.
[0018]
Other purposes of this invention are offering a re-transmission mechanism for the data unit received accidentally. In an instantiation-example, each data packet contains the number of schedules of the data unit which has each data unit checked with the number of sequences. By inaccurate reception of one or the data unit beyond it, a mobile station sends the negative acknowledge (NACK) which shows the number of sequences of the data unit which could not be caught to a hard flow link DCH for re-transmission from a base station. A base station can receive a NACK message and can re-transmit the data unit received accidentally.
[0019]
Other purposes of this invention are choosing the base station candidate with the best communication link based on the procedure described by U.S. patent application No.08/790,497 entitled "the approach and equipment" for performing the software hand off in a radio communications system for whom it applied on January 29, 1997 which was transferred to the grantee of this invention and incorporated here as bibliography for a mobile station. In an instantiation-example, a base station will be added to the active group of a mobile office, if the received pilot signal exceeds the addition threshold of a schedule, and supposing a pilot signal is below the fall threshold of a schedule, it can be dropped from an active group. In an alternative example, a base station may already be added to an active group, if the energy of the base station in the additional energy (for example, measured by the pilot signal) of a base station and an active group exceeds the threshold of a schedule. Use of this alternative example does not add the base station containing an amount without the parenchyma of the whole energy with which the transmitted energy was received by the mobile station to an active group.
[0020]
Other purposes of this invention are the approaches which ensure that it is from the base station where forward direction link transmission in the time amount slot to which only the base station where it was chosen between the mobile office and the base station in a communication link could distinguish the DRC message, and arbitration was given by it was chosen, and are transmitting a data rate demand on a DRC channel for a mobile office. In an instantiation-example, a mobile station and each base station in a communication link can assign only one Walsh (Walsh) code. A mobile station covers a DRC message in Walsh code corresponding to the selected base station. The Walsh code is desirable although it can be used since other codes cover a DRC message, and a rectangular code is used typically.
[0021]
The description, the purpose, and advantage of this invention will become clearer from the detailed description shown below, when the same reference designator is caught combining drawing which is the same in correspondence through drawing.
[0022]
Detailed description of a desirable example According to the instantiation-example of the data telecommunication system of this invention, forward direction link data transmission happens from one base station to one mobile office by the data rate near the max or it which may be supported by the forward direction link and the system (refer to drawing 1). Hard flow link data communication may happen from one mobile station to one or the base station beyond it. Count of the maximum data of forward direction link transmission is described by the detail below. Data are divided within a data packet and each data packet is transmitted [one or the time amount slot beyond it (namely, slot)]. In each time amount slot, a base station can carry out immediate-data transmission to the mobile station of the arbitration in a base station and a communication link.

[0023]
First, a mobile station establishes a base station and a communication link using handshaking of a schedule. In this connection condition, a mobile office can receive data and a control message from a base station, and can transmit data and a control message to a base station. A mobile station supervises the forward direction link for transmission from the base station which is in the active group of a mobile station from it. An active group includes the list of a mobile station and base stations in a communication link. Especially a mobile station measures an active group's signal pair noise and active jamming ratio (C/I) from a base station of a forward direction link pilot wave, when received by the mobile station. If it is beyond the addition threshold of a schedule of the received pilot signal or is below the fall threshold of a schedule, a mobile station will report this to a base station. the next message from a base station -- respectively -- the active group -- or in order to add or delete a base station from a group, it turns to a mobile station. The operational status with various mobile stations is described below.
[0024]
If there are no data to send, a mobile station will interrupt transmission of return and the data rate information on a base station in the play condition. While a mobile station plays and being in a condition, a mobile station supervises the control channel from the base station beyond one or it of an active group for a paging message.
[0025]
If there are data which should be transmitted to a mobile station, data will be sent to all the base stations of an active group with a CC vessel, and will be memorized by the queue in each base station. A paging message is sent to a mobile station on each control channel from it by one or the base station beyond it. Even when the mobile station has switched between base stations, in order to secure reception, a base station may cross two or more base stations, and may transmit all the starting paging messages to the same time amount. A mobile station restores to it and decodes the signal of one or the control channel beyond it in order to receive a paging message.
[0026]
It is decode of a paging message, and when received by the mobile station, a mobile station measures C/I of the forward direction link signal from the base station of an active group about each time amount slot, until data transmission is completed. C/I of a forward direction link signal may be obtained by measuring each pilot signal. A mobile station chooses the best base station from it based on the parameter of a lot. The group of a parameter may include current, pre- C / I measurement and a bit error rate, or a packet error rate. For example, the best base station may be chosen based on the largest C/I measurement. A mobile station checks the best base station from it, and transmits it to the base station which had the data demand message (henceforth quoted as a DRC message) chosen by the data demand channel (henceforth quoted as a DRC channel). A DRC message may include the display (for example, C / I measurement itself, a bit error rate, or a packet error rate) of the quality of a forward direction link channel instead of the demanded data rate. In an instantiation-example, a mobile station can turn transmission of a DRC message to a specific base station by use of the Walsh code which has only one and identifies a base station. Exclusive OR (XOR) of the DRC message notation is carried out only in one Walsh code. Since each base station in the active group of a mobile station is checked only in one Walsh code, only the selected base station which performs the same XOR operation so that a mobile station may perform in exact Walsh code can decode a DRC message correctly. A base station uses the rate control information from each mobile station in order to transmit forward direction link data efficiently at the highest possible rate.
[0027]
By each time amount slot, a base station can choose some of mobile stations called for data transmission. A base station determines the data rate for transmitting data to the mobile station chosen from it based on the latest value of the DRC message received from the mobile station. In addition, by using the diffusion code which has only one to the mobile station, there is only one base station and it checks transmission to a specific mobile station. In an instantiation-example, this diffusion code is a

long false noise (PN) code defined according to the IS-95 criterion.
[0028]
Since a data packet is meant, a mobile station receives data transmission and decodes a data packet. Each data packet contains two or more data units. In an instantiation-example, a data unit is within the limits of this invention, although different data unit size may be defined including eight information bits. In an instantiation-example, each data unit unites with the number of sequences, and or it mistook the mobile office, it can check any of duplicate transmission they are. A mobile station communicates the number of sequences of a wrong data unit through a hard flow link DCH to this result. A data unit directs the base station controller which receives a data message from a mobile station from it to all the base stations that are communicating with this specific mobile station that was not received by the mobile station. A base station plans re-transmission of this data unit from it.
[0029]
Each mobile station in a data telecommunication system can communicate with the plural base stations on a hard flow link. In an instantiation-example, the data telecommunication system of this invention supports the software hand off and SOFUTA (softer) hand off of a hard flow link for two or more reasons. It permits transmitting data with the minimum power level which a software hand off does not consume an additional capacity of a hard flow link to the 1st, but at least one base station trusts a mobile station rather, and can decode data. Reception of the hard flow link signal by more base stations increases the dependability of transmission to the 2nd, and needs only the additional hardware in a base station for it.
[0030]
In an instantiation-example, the forward direction link capacity of the data transmission system of this invention is determined by the rate demand of a mobile station. The additional gain in forward direction link capacity may be attained by a directional antenna and/or the adaptability spatial filter.
The instantiation-approach and equipment which offer directivity transmission It is transferred to both the grantees of this invention. Here and as bibliography U.S. patent application No.08/575,049 under continuation entitled "the approach and equipment" of the incorporated December 20, 1995 application which determine the transmission data rate in plural user communication system, and "rectangular cross spot beam of September 8, 1997 application, It is described by U.S. patent application No.08/925,521 entitled approach and equipment" which offers a sector and a pico cel.
(1) Description of a system When a Fig. is referred to, drawing 1 expresses the instantiation-data telecommunication system of this invention containing much cel 2a-2g. Each cel 2 is served by the corresponding base station 4. The various mobile stations 6 spread through a data telecommunication system. In an instantiation-example, although each mobile station 6 communicates with at most one base station 4 of a forward direction link by each time amount slot, it may be in one, or the base station 4 beyond it and communication link of a hard flow link depending on whether the mobile station 6 is in a software hand off. For example, base station 4a transmits data to mobile station 6a exclusively, and base station 4c transmits exclusive data to mobile station 6c of a forward direction link by the time amount slot n. In drawing 1 , the continuous line of an arrow shows the data transmission from the base station 4 to the mobile office 6. Although, as for the broken line of an arrow, the mobile station 6 has received the pilot signal, there is no data transmission from a base station 4. A hard flow link communication link is not shown in drawing 1 for simplification.
[0031]
As shown in drawing 1 , each base station 4 transmits data to one mobile office 6 at the moment of if possible arbitration being given. The mobile station 6 and they which carried out the location soon can receive a pilot signal from many base stations 4 especially on a cel boundary. Supposing a pilot signal is beyond the threshold of a schedule, the mobile station 6 can require that a base station 4 should be added to the active group of the mobile station 6. In an instantiation-example, the mobile station 6 can receive data transmission from the zero of an active group, or one member.
[0032]
The block diagram showing the basic subsystem of the data telecommunication system of this invention

is shown in drawing 2 . The base station controller 10 touches the packet network interface 24, PSTN30, and all the base stations 4 (only only one base station 4 is shown in drawing 2 for simplification) in a data telecommunication system. The base station controller 10 adjusts the communication link between the mobile station 6 in a data telecommunication system, the packet network interface 24, and PSTN30. PSTN30 touches a user through a standard telephone network (not shown in drawing 2).

[0033]

Also although only one should show the base station controller 10 to drawing 2 for simplification, it contains many selector elements 14. One selector element 14 is assigned in order to control the communication link between one or the base station 4 beyond it, and one mobile station 6. Supposing the selector element 14 is not assigned to the mobile station 6, the need of calling the mobile station 6 will be notified to the cel control processor 16. The cel control processor 16 directs a base station 4, in order to call the mobile station 6 from it.

[0034]

The source 20 of data contains the data which should be transmitted to the mobile station 6. The source 20 of data supplies data to the packet network interface 24. The packet network interface 24 receives data and ships data to the selection element 14. The selector element 14 sends data to the mobile station 6 and each base station 4 in a communication link. Each base station 4 maintains the data queue 40 containing the data which should be transmitted to the mobile station 6.

[0035]

In an instantiation-example, a data packet quotes the amount of the schedule of data which has been independent of a data rate on a forward direction link. A data packet is formalized and encoded in other bits controlled and coded. Supposing data transmission continues and happens to many Walsh channels, the encoded packet will be un-multiplexed by parallel flow and each flow will be transmitted by one Walsh channel.

[0036]

Data are sent to the channel element 42 from the data queue 40 by the data packet. The channel element 42 inserts required control field for each data packet. A data packet, control field, a frame-check-sequence bit, and a code tail bit contain the format-ized packet. From it, the channel element 42 encodes one or the format-ized packet beyond it, and interleaves a notation in the encoded packet (or re-sequencing). Next, the interleaved packet is stirred by the scrambling sequence, is covered with Walsh covering, and is diffused in a long PN code, short PNI, and PNQ code. Quadrature modulation of the diffused data is carried out by the transmitter in the RF unit 44, and they are filtered and amplified. A forward direction link signal is transmitted to the forward direction link 50 across the air through an antenna 46.

[0037]

By the mobile station 6, it is received by the antenna 60 and a forward direction link signal is shipped to the receiver in the anterior part edge 62. A receiver filters a signal, amplifies and carries out a right-angle recovery, and quantizes it. In a long PN code, short PNI, and PNQ code, it is dediffused, and a demodulator (DEMOD) 64 is supplied, it is [it decovers with Walsh covering, and] the same scrambling sequence, and the digitized signals are descrambling **** there. The data to which it restored are supplied to the decoder 66 which performs the reverse of the signal-processing function made in the base station 4 especially a deinterleave, decode, and a frame check function. The decoded data are supplied to a data sink 68. As mentioned above, hardware supports data, a message, voice, video, and other communication links on a forward direction link.

[0038]

System control and a schedule function may be attained by many means. It depends for installation of a channel scheduler 48 on whether center-izing, or decentralized control / schedule processing is desired. For example, a channel scheduler 48 may be installed in each base station 4 for decentralization processing. On the contrary, for center-ized processing, a channel scheduler 48 is installed in the base station controller 10, and it may be designed so that the data transmission of many base stations 4 may be adjusted. Other means of the function by which description was carried out [above-mentioned] may

be considered carefully, and are within the limits of this invention.

[0039]

As shown in drawing 1 , the mobile office 6 is spread through a data telecommunication system, and may be in zero or one base station 4, and communication link by the forward direction link. In an instantiation-example, a channel scheduler 48 adjusts the forward direction link data transmission of one base station 4. In an instantiation-example, it connects with the data queue 40 and the channel element 42 in a base station 4, and a channel scheduler 48 receives the queue size which shows the amount of the data transmitted to the mobile station 6, and the DRC message from the mobile station 6. A channel scheduler 48 carries out the schedule of the high data transmission so that the system goal of the maximum data throughput and the minimum transmission lag may be optimized.

[0040]

In an instantiation-example, the schedule of the data transmission is carried out based on the quality of a communication link in part. The instantiation-communication system which chooses the baud transmission rate based on the quality of a link is indicated by U.S. patent application No.08/741,320 entitled "the approach and equipment" of the September 11, 1996 application which was transferred to the grantee of this invention and incorporated here as bibliography which offer the high-speed data transmission in a cellular environment. Carrying out the schedule of the data communication may have a foundation placed in this invention by additional consideration like a user's GOS, queue size, data type, the amount of the already experienced delay, and the error rate of data transmission. These the consideration of both is U.S. patent application No.08/798,951 entitled "the approach and equipment" of the rate scheduling of a forward direction link of the February 11, 1997 application which was transferred to the grantee of this invention and incorporated here as bibliography, and U.S. patent-application No. entitled "the approach and equipment" of the rate scheduling of a hard flow link link of an application on August 20, 1997. It is described by the detail. Other factors are taken into consideration by data transmission scheduling, and are within the limits of this invention.

[0041]

The data telecommunication system of this invention supports the data of a hard flow link, and message transmission. In the mobile station 6, when a controller 76 ships data and a message to an encoder 72, data and message transmission are processed. A controller 76 may be carried out by ASIC programmed in order to perform a microcontroller, a microprocessor, a digital-signal-processing (DSP) chip, or a function that was described here.

[0042]

In an instantiation-example, an encoder 72 encodes a message without being contradictory to the blank and burst signal data format which were described by the above-mentioned U.S. patent No.5,504,773. From it, an encoder 72 generates and attaches the CRC bit of a lot, attaches the code tail bit of a lot, and encodes data and the attached bit, and re-sets a notation in order in the encoded data. The interleaved data are supplied to a modulator (MOD) 74.

[0043]

A modulator 74 may be carried out in many the examples. In an instantiation-example (refer to drawing 13), the interleaved data are covered in Walsh code, are diffused in a long PN code, and are diffused in a still shorter PN code. The diffused data are supplied to the transmitter in the anterior part edge 62. It becomes irregular, and a transmitter is filtered and amplified, and transmits a hard flow link signal in the air by the hard flow link 52 through an antenna 46.

[0044]

In an instantiation-example, the mobile station 6 diffuses hard flow link data according to a long PN code. Each hard flow link channel is defined according to time offset of common long PN sequence. By two different offset, the modulation sequence as a result loses an interrelation. Offset of the mobile station 6 is determined according to the figure discernment only with one of the mobile stations 6, and the mobile station 6 is a mobile station specification identification number in the instantiation-example of IS-95. In this way, each mobile station 6 is transmitted to the hard flow link channel without one correlation determined according to an electronic continuation figure only with one of them.

[0045]
In a base station 4, it is received by the antenna 46 and a hard flow link signal is supplied to the RF unit 44. The RF unit 44 filters, amplifies and gets over, quantizes a signal and supplies the digitized signal to the channel element 42. The channel element 42 dediffuses the signal digitized by the short PN code and the long PN code. The channel element 42 performs decovering, a pilot wave, and DRC sampling in Walsh code again. From it, the channel element 42 decodes a resequencing opium poppy and the deinterleaved data for the data to which it restored, and performs a CRC-check function. The decoded data, for example, data, and a message are supplied to the selector element 14. The selector element 14 ships data and a message to a suitable destination. The channel element 42 may transmit the nature directions with which the condition of a hard flow data packet is expressed again to the selector element 14.
[0046]
In an instantiation-example, the mobile station 6 may be in one of the three operational status. The instantiation-state diagram showing the shift between the various operational status of the mobile office 6 is shown in drawing 17. The mobile station 6 waits for channel assignment according a connection probe to delivery and a base station 4 in the access condition 902. Channel assignment includes assignment of a resource like a power control channel and frequency assignment. The mobile station 6 is called, and if changed into the data transmission which comes soon, or supposing the mobile station 6 transmits data to a hard flow link, the mobile station 6 can shift to the connection condition 904 from the access condition 902. In the connection condition 904, the mobile station 6 exchanges data (for example, transmission or reception), and performs hand off operation. The mobile station 6 plays completion of a release procedure from the connection condition 904, and shifts to a condition 906 in it. If the mobile station 6 has connection with a base station 4 refused, it plays from the access condition 902 and can shift to a condition 906 again. In the play condition 906, by receiving and decoding the message of a forward direction control channel, the mobile station 6 hears an overhead and a paging message, and performs a play hand off procedure. The mobile station 6 can shift to the access condition 902 by starting a procedure. The state diagram shown in drawing 17 is only the instantiation-condition definition shown for explanation. Other state diagrams may be used again and are within the limits of this invention.
(2) Forward direction link data transmission In an instantiation-example, initiation of the communication link between the mobile station 6 and a base station 4 takes place by the approach similar to it for a CDMA system. The mobile station 6 supervises the control channel of a paging message after completion of a call setup. while [being in a connection condition] The mobile station 6 begins to transmit a pilot signal, link [hard flow].
[0047]
The instantiation-flow chart of the forward direction link high data transmission of this invention is shown in drawing 12. Supposing a base station 4 has data transmitted to the mobile station 6, a base station 4 will send the paging message by which the address was carried out to the control channel with block 502 to the mobile station 6.
A paging message may be sent from the base station 4 of one or a large number depending on the hand off condition of the mobile station 6. By reception of a paging message, the mobile station 6 begins a C/I measurements process with block 504. C/I of a forward direction link signal is calculated from one or the combination of an approach described below. From it, the mobile station 6 chooses the demanded data rate based on the best C/I measurement, and transmits a DRC message to a DRC channel with block 506.
[0048]
Within the same time amount slot, a base station 4 receives a DRC message with block 508. If the following time amount slot is available because of data transmission, a base station 4 transmits data to the mobile station 6 by the data rate demanded by block 510. The mobile station 6 receives data transmission with block 512. Supposing the following time amount slot is available, a base station 4 will transmit the remainder of a packet with block 514, and the mobile station 6 will receive data

transmission with block 516.

[0049]

In this invention, the mobile station 6 can communicate to one, or the base station 4 and coincidence beyond it. Action is taken by the mobile station 6 which was dependent on whether the mobile station 6 is in a software hand off, or there is nothing. In these two cases, it argues separately below.

(3) When there is no hand off When there is no hand off, the mobile station 6 communicates with one base station 4. Reference of drawing 2 supplies the data planned for the specific mobile office 6 to the selector element 14 assigned in order to control the communication link with the mobile office 6. The selector element 14 transmits the data to the data queue 40 in a base station 4. A base station 4 makes data a queue and transmits a paging message to a control channel. A base station 4 supervises a hard flow link DRC channel for the DRC message from [from it] the mobile station 6. Supposing a signal is not detected by the DRC channel, a base station 4 can re-transmit a paging message until a DRC message is detected. After the count of a schedule of a re-transmission attempt, a base station 4 can end the process or re-initiation which calls the mobile station 6.

[0050]

In an instantiation-example, the mobile station 6 transmits the data rate required of the base station 4 by the DRC channel in the form of a DRC message. In an alternative example, the mobile station 6 transmits the display (for example, C / I measurement) of the quality of a forward direction link channel to a base station 4. In an instantiation-example, a triplet DRC message is decoded by the base station 4 by software decision. In an instantiation-example, a DRC message is transmitted within the one half which each time amount slot begins. If available in order that that time amount slot may carry out data transmission to this mobile station 6, from it, a base station 4 will have the remaining one half of a time amount slot in order to decode a DRC message, and will form the hardware for data transmission by the time amount slot which a degree follows. If the time amount slot which a degree follows is not available, it will keep on a base station 4 supervising a DRC channel for the following available time amount slot for waiting and a new DRC message.

[0051]

In the 1st example, a base station 4 is transmitted by the demanded data rate. This example consults with the mobile station 6 on the important decision of data rate selection. Transmitting by the always demanded data rate has the advantage which gets to know the data rate which the mobile station 6 expects. In this way, the mobile station 6 carries out only recovery and decode for a traffic channel according to the demanded data rate. A base station 4 must not transmit the message which indicates that the data rate is used by the base station 4 to the mobile office 6.

[0052]

In the 1st example, it tries continuously for the mobile station 6 to restore to data by the demanded data rate after reception of a paging message. The mobile station 6 restores to a forward direction traffic channel, and supplies a software decision notation to a decoder. A decoder decodes a notation, and it performs the frame check of the decoded packet in order to determine whether the packet was received correctly. Supposing the packet was received accidentally or a packet is turned to other mobile stations 6, the frame check will display the packet error. Instead of the 1st example, the mobile station 6 restores to the data of a slot by slot criteria. In an instantiation-example, the mobile office 6 can determine whether data transmission was turned to it based on the preamble incorporated in the each transmitted data packet so that it may be described below. If it is determined that transmission is in this way turned to other mobile stations 6, the mobile station 6 can end a decode process. In the case of which, the mobile station 6 transmits a negative-acknowledge (NACK) message to a base station 4 in order to accept inaccurate reception of a data unit. The data unit accidentally received by reception of a NACK message is re-transmitted.

[0053]

Transmission of a NACK message may be carried out by the approach which resembled transmission of an error indication bit (EIB) in the CDMA system. Operation and use of EIB transmission are described by U.S. patent No.5,568,483 entitled "the approach and equipment" of format-izing of data for

transmission which were transferred to the grantee of this invention and incorporated here as bibliography. Instead, NACK may be transmitted with a message.
[0054]
In the 2nd example, a data rate is determined by the base station 4 in the input from the mobile station 6. The mobile station 6 performs C / I measurement, and is the display (for example, C/I measurement) of the quality of a link.
It transmits to a base station 4. A base station 4 can adjust the data rate required of a base station 4 like queue size and available transmission power based on the available resource. In advance of the data transmission in the adjusted data rate, the adjusted data rate may be transmitted to coincidence to the mobile station 6, or may be tacitly included in coding of a data packet. When [1st] the mobile station 6 receives the data rate adjusted before data transmission, the mobile station 6 restores to it and decodes the packet received by the approach described in the 1st example. When [2nd] the adjusted data rate is transmitted to data transmission and coincidence to the mobile station 6, the mobile station 6 restores to a forward direction traffic channel, and memorizes the data to which it restored. By reception of the adjusted data rate, the mobile station 6 decodes data according to the adjusted data rate. And it sets, when [3rd] tacitly contained in the data packet by which the adjusted data rate was encoded, and the mobile station 6 determines a baud transmission rate inductively for selection of the data restored to which, and decoded and decoded in all the rates of a candidate. Both the approaches and equipment that make a rate decision are transferred to the grantee of this invention. Here and as bibliography U.S. patent application No.08/730,863 entitled "the approach and equipment" of the incorporated October 18, 1996 application which determine the rate of the received data in the rate communication system of adjustable -- and -- again -- Year The moon The rate of the received data in the rate communication system of "adjustable of a day application It is described by the detail at patent application No.PA436 entitled approach and equipment" to determine. About all the cases where it is described above, supposing the result of a frame check is negation, the mobile station 6 will transmit a NACK message, as mentioned above.
[0055]
future arguments -- otherwise, except for the time of being displayed, it is based on the 1st example which transmits the DRC message indicator of the data rate as which the mobile station 6 was required to a base station 4. However, the mobile station 6 can apply the concept of invention indicated here equally to the 2nd example which transmits the display of the quality of a link to a base station 4.
(4) In the case of a hand off In the case of a hand off, the mobile station 6 communicates with many base stations 4 by the hard flow link. In an instantiation-example, the data transmission of the forward direction link to the specific mobile station 6 happens from one base station 4. However, the mobile station 6 receives the pilot signal from many base stations 4 to coincidence. If C/I measurement of a base station 4 is beyond the threshold of a schedule, a base station 4 is added to the active group of the mobile station 6. The inside of a software hand off prompting message and the new base station 4 are hard flow power control (RPC) described below. The mobile station 6 is assigned to the Walsh channel. The mobile station 6 and each base station 4 in a software hand off supervise hard flow link transmission, and send a RPC bit to each of those RPC Walsh channel.
[0056]
If drawing 2 is referred to, the selector element 14 assigned in order to control the communication link with the mobile office 6 will transmit data to all the base stations 4 in the active group of the mobile office 6. All the base stations 4 that receive data from the selector element 14 transmit a paging message to the mobile station 6 by each of those control channel. When the mobile station 6 is in a control state, the mobile station 6 performs two functions. The mobile station 6 chooses the best base station 4 as the 1st based on the group of the parameter which are best C / I measurement, and is obtained. The mobile station 6 chooses the data rate corresponding to C/I measurement from it, and transmits a DRC message to the selected base station 4. By covering a DRC message with Walsh covering assigned to the specific base station 4, the mobile station 6 can carry out direct transmission of the DRC message to the specific base station 4. the 2nd -- the mobile station 6 -- each -- it tries to restore to a forward direction link

signal according to the data rate demanded by the following time amount slot.
[0057]
All the base stations 4 in an active group supervise a DRC channel after transmission of a paging message for the DRC message from the mobile station 6. Again, since a DRC message is covered in Walsh code, the selected base station 4 assigned with the same Walsh covering can decover a DRC message. The base station 4 chosen by reception of a DRC message transmits data to the mobile station 6 by the following available time amount slot.
[0058]
In an instantiation-example, a base station 4 transmits the data of the packet containing two or more data units by the demanded data rate to the mobile station 6. Supposing a data unit is received by incorrectness by the mobile station 6, a NACK message will be transmitted to all the base stations 4 in an active group by the hard flow link. In an instantiation-example, a NACK message gets over by the base station 4, and is decrypted, and is transmitted to the selector element 14 for processing. By the NACK message, a data unit is re-transmitted using a procedure which was described above. In an instantiation-example, the selector element 14 combines with one NACK message the NACK signal received from all the base stations 4, and sends a NACK message to all the base stations 4 of an active group.
[0059]
In an instantiation-example, the mobile station 6 can detect the change in the best C/I measurement, and it requires data transmission dynamically from a base station 4 which is different by each time amount slot in order to improve effectiveness. In an instantiation-example, since data transmission happens only from one base station 4 by the time amount slot to which arbitration was given, other active base stations 4 of a group may not notice that the data unit was transmitted to the mobile station 6, even if it is. In an instantiation-example, the base station 4 currently transmitted reports data transmission to the selector element 14. The selector element 14 sends a message to all the base stations 4 of an active group from it. In an instantiation-example, it is assumed that the transmitted data were correctly received by the mobile station 6, so -- if -- the mobile station 6 -- if the data transmission from the base station 4 where active groups differ is required, the new base station 4 will transmit the data unit which remains. In an instantiation-example, the new base station 4 is transmitted according to the renewal of transmission of the last from the selector element 14. Instead, in order to transmit the new base station 4 using the predictive system based on measuring like renewal of the point from an average baud transmission rate and the selector element 14, it chooses the following data unit. These devices make the minimum re-transmission of a repetition of the same data unit by many base stations 4 by different time amount slot which brings about loss of effectiveness. Since it will be identified only in one sequence figure so that each data unit may be described below supposing pre- transmission is received by the error, as for a base station 4, these data units can be re-transmitted out of a sequence.
a hole (namely, data unit which was not transmitted) is made in an instantiation-example (as a result of the hand off between one base station 4 and other base stations 4) -- it is -- the data unit which could not be caught is taken into consideration as if it was received accidentally. The mobile station 6 transmits the NACK message corresponding to the data unit which could not be caught, and these data units are re-transmitted.
[0060]
In an instantiation-example, each base station 4 in an active group maintains the independent data queue containing the data which should be transmitted to the mobile station 6. The selected base station 4 transmits the data which exist in the data queue 40 in order of a sequence except for the message told by the signal for re-transmission of the data unit received accidentally. In an instantiation-example, the transmitted data unit is deleted from the queue 40 after transmission.
(5) Other consideration of forward direction link data transmission In the data telecommunication system of this invention, the important problem which should be taken into consideration is the precision of C / I calculation for choosing the data rate of future transmission. In an instantiation-example, C/I measurement is performed with the pilot signal in a time interval with which a base station

4 transmits a pilot signal. In an instantiation-example, among this pilot time interval, since only a pilot signal is transmitted, the effect of a multiplex path and active jamming is min.

[0061]

In other means of this invention by which a pilot signal is continuously transmitted on a rectangular code channel like it of an IS-95 system, the effect of a multiplex path and active jamming can distort C/I measurement. Similarly, when performing C/I measurement by data transmission instead of a pilot signal, a multiplex path and active jamming may drop C/I measurement again. Since other active jamming signals do not exist in both these cases while one base station 4 is transmitting to one mobile office 6, the mobile office 6 can measure correctly C/I of a forward direction link signal. However, when the mobile office 6 is in a software hand off and a pilot signal is received from many base stations 4, as for the mobile office 6, a base station 4 cannot identify whether data were transmitted or not. In the scenario in the case of being the worst, while the base station 4 is not transmitting data to the mobile station 6 of arbitration, the mobile station 6 can measure high C/I by the 1st time amount slot, and while all the base stations 4 are transmitting data by the same time amount slot, data transmission is received by the 2nd time amount slot. Since the condition of a data telecommunication system changed when all the base stations 4 were in play, C / I measurement by the 1st hour slot give the display which the quality of a forward direction link signal in the 2nd hour slot mistook. Actual C/I in the 2nd hour slot may actually descend at the point in which the dependability decoded by the demanded data rate is impossible.

[0062]

A scenario extreme on the contrary exists, when C/I calculation by the mobile station 6 is carried out to the maximum active jamming in ****. However, actual transmission takes place, while only the selected base station is transmitting. In this case, C / I calculation, and the selected data rate are moderate, and transmission takes place at a rate lower than the rate which trusts it and may be decoded, and decreases transmission efficiency in this way.

[0063]

In a means by which C/I measurement is performed by the continuation pilot signal or the traffic signal, prediction of C/I in the 2nd hour slot based on measurement of C/I in the 1st hour slot may be made still more correctly by three examples. In the 1st example, the data transmission from a base station 4 is controlled not to toggle between transmission and a play condition continually in the time amount slot which a base station 4 follows. This may be attained by carrying out the queue of data (beforehand constant [For example, an information bit]) sufficient before the actual data transmission to the mobile station 6.

[0064]

In the 2nd example, each base station 4 transmits the forward direction activity bit (it quotes as a FAC bit henceforth) which indicates whether transmission takes place with the following half-frame. Use of a FAC bit is described by the detail below. The mobile station 6 performs C/I measurement in consideration of the FAC bit received from each base station 4.

[0065]

It corresponds to the system for which the display of the quality of a link is transmitted to a base station 4, and the schedule information display to which one base station 4 transmitted data by each time amount slot is made by the channel scheduler 48 available in the 3rd example which uses the center-ized schedule system. From the mobile station 6, a channel scheduler 48 receives C/I measurement and can adjust C / I measurement based on the existence of data transmission or its absent knowledge from each base station 4 in a data telecommunication system. For example, the mobile station 6 can measure C/I by the 1st hour slot, while the base station 4 not adjoining is transmitting. Measured C/I is supplied to a channel scheduler 48. Since the schedule of nothing was carried out by the channel scheduler 48, a channel scheduler 48 gets to know that the base station 4 not adjoining transmitted data to the 1st hour slot. In schedule-data transmission by the 2nd hour slot, a channel scheduler 48 knows whether one or the adjoining base station 4 beyond it will transmit data. A channel scheduler 48 can adjust C/I by which the mobile office 6 was measured by the 1st hour slot in consideration of the additional active jamming

which will be received by the 2nd time amount slot by the data transmission by the adjoining base station 4. While it is transmitting adjoining base station 4 and these adjoining base stations 4 are not transmitting by the 2nd hour slot instead, supposing C/I is measured by the 1st hour slot, a channel scheduler 48 can adjust C/I measurement in consideration of additional information.
[0066]
Other important problems which should be taken into consideration are minimum-izing duplicate re-transmission. Duplicate re-transmission may be brought about from permitting choosing the data transmission from a base station 4 which is different by the time amount slot which the mobile station 6 followed. Supposing the mobile station 6 is in abbreviation etc. by carrying out for these base stations 4 and measures C/I, the best C/I measurement can be toggled between two or the base station 4 beyond it [the continuous time amount slot]. It may sometimes toggle by the deviation in C/I measurement, and/or change in a channel condition. The data transmission from a base station 4 which is different by the continuous time amount slot may bring loss to effectiveness.
[0067]
The address of the toggle problem may be carried out by use of a hysteresis. A hysteresis may be carried out in the combination of a signal level system, a timing system, or a signal level and a timing system. In an instantiation-signal level system, better C/I measurement of a different base station 4 in an active group is not chosen until it exceeds C/I measurement of the base station 4 currently actually transmitted with the amount of hystereses at least. As an example, a hysteresis assumes that C/I measurement of the 1st base station 4 is [3.5dB and C/I measurement of the 2nd base station 4] 3.0dB by 1.0dB and the 1st hour slot. By the following time amount slot, the 2nd base station 4 is not chosen until the C/I measurement becomes high at least 1.0dB from that of the 1st base station 4. In this way, supposing C/I measurement of the 1st base station 4 is still 3.5dB in the following time amount slot, the 2nd base station 4 will not be chosen until the C/I measurement is set to at least 4.5dB.
[0068]
In an instantiation-timing system, a base station 4 transmits a data packet to the mobile station 6 about the number of the schedules of a time amount slot. The mobile station 6 is not allowed to choose a different base station 4 currently transmitted within the number of the schedules of a time amount slot. The mobile station 6 continues measuring C/I of the base station 4 currently actually transmitted by each time amount slot, answers C/I measurement, and chooses a data rate.
[0069]
Another important problem which should be taken into consideration is the effectiveness of data transmission. When drawing 9 and 10 are referred to, each data packet formats 410 and 430 contain data and an overhead bit. In an instantiation-example, the number of overhead bits is fixed for all data rates. The percent of an overhead is small about a packet size, and its effectiveness is high at the highest data rate. By the lower data rate, bigger percent than that of an overhead bit packet may be included. The non-effectiveness in a lower data rate may be improved by the variable-length data packet currently transmitted to the mobile station 6.
A variable-length data packet is divided and may be transmitted to the mobile station 6 [many time amount slots]. Preferably, a variable-length data packet is transmitted to the mobile station 6 [the time amount slot which continued in order to simplify processing]. This invention is turned to use of an adjustable packet size about the data rate by which versatility was supported in order to improve the whole transmission efficiency.
(6) Forward direction link architecture In an instantiation-example, a base station 4 is transmitted by the maximum data rate supported by the data telecommunication system to the single mobile station 6 by the slot to which it is the maximum power available to a base station 4, and arbitration was given. The maximum data rate which may be supported is dynamic and it is dependent on C/I of a forward direction link signal which was measured by the mobile station 6. Preferably, a base station 4 is transmitted to only one mobile station 6 by the time amount slot to which arbitration was given.
[0070]
In order to make data transmission easy, a forward direction link contains four channels by which time-

multiplexing was carried out, a pilot channel, a power control channel, a control channel, and a traffic channel. Each function and means of these channels are described below. In an instantiation-example, traffic and a power control channel contain the Walsh channel respectively diffused like some rectangular crosses. In this invention, a traffic channel is used in order to transmit traffic data and a paging message to the mobile station 6. When being used in order to transmit a paging message, a traffic channel is quoted as a control channel in this specification again.

[0071]

The bandwidth of a forward direction link is chosen as 1.2288MHz in an instantiation-example. It permits that this bandwidth uses the existing hardware configuration element designed for the CDMA system which adapts itself to an IS-95 criterion. However, the data telecommunication system of this invention may be adopted for use with bandwidth which is different in order to improve capacity, and/or in order to adapt itself to a system demand. For example, since 5 MHz bandwidth increases capacity, it may be used. furthermore, in order that the bandwidth of a forward direction link and a hard flow link may crowd more and may balance link capacity with need, it differs (for example, bandwidth 5 MHz of a forward direction link and bandwidth of 1.2288MHz of a hard flow link) -- it can do like.

[0072]

In an instantiation-example, short PNI and the short PNQ code are the same die-length 215 PN code specified according to the IS-95 criterion. At the rate of a 1.2288MHz chip, short PN sequence is repeated every 26.67msec(s) {26.67msec=215 / 1.2288x106}. The same short PN code is used in an instantiation-example by all the base stations 4 in a data telecommunication system. However, each base station 4 is identified by the offset only with one of the fundamental short PN sequences. In an instantiation-example, offset is in the increment of 64 chips. Other bandwidth and PN codes may be used and it is within the limits of this invention.

(7) Forward direction link traffic channel The block diagram of the instantiation-forward direction link architecture of this invention is shown in drawing 3 . Data are divided into a data packet and supplied to the CRC encoder 112. For each data packet, the CRC encoder 112 generates a frame check bit (for example, CRC parity bit), and inserts a code tail bit. The packet format-ized from the CRC encoder 112 contains data, a frame check, a code tail bit, and other overhead bits described below. The format-ized packet is supplied to an encoder 114, and it encodes a packet in an instantiation-example according to the coding format described by U.S. patent application No.08/743,688 mentioned above. Other coding formats may be used and it is within the limits of this invention. The packet encoded from the encoder 114 is supplied to the interleaver 116 which carries out re-sequence of the code symbol within a packet. The interleaved packet is supplied to the frame blowout tea element 118 from which the fraction of a packet is removed by the approach described below. The packet by which blowout tea was carried out is supplied to the multiplier 120 which stirs data by the scrambling sequence from the scrambling machine 122. The blowout tea element 118 and the scrambling machine 122 are described by the detail below. The output from a multiplier 120 contains the stirred packet.

[0073]

The stirred packet is supplied to the rate controller 130 of adjustable which demultiplexes a packet to K juxtaposition in phase (inphase) and a right-angle channel, and K is dependent on a data rate here. In an instantiation-example, the stirred packet is first demultiplexed by the flow of an in phase (I) and a right angle (Q). In I style, in an instantiation-example, Q style includes odd notations with an index including even notations with an index. Further, each flow is demultiplexed by K parallel channel so that the rate of a notation of each channel may be fixed about all data rates. K channels of each flow are supplied to the Walsh covering element 132 which covers each channel by the Walsh function in order to offer a direct channel. Direct channel data are supplied to the gain element 134 which carries out scale doubling of the data, in order to maintain whole energy (and so fixed output power) the whole chip fixed about all data rates. The data by which scale doubling was carried out from the gain element 134 are supplied to the multiplexer (MUX) 160 which multiplexes data by the preamble. A preamble is described by the detail below. The output from MUX160 is supplied to traffic data, a power control bit, and the multiplexer (MUX) 162 that multiplexes pilot data. The output of MUX162 contains I Walsh channel

and Q Walsh channel.

[0074]

The block diagram of the instantiation-modulator used in order to modulate data is shown in drawing 4 . I Walsh channel and Q Walsh channel are supplied to Counters 212a and 212b, respectively, and it totals K Walsh channel in order to offer Isum and Qsum, respectively. Isum and a Qsum signal are supplied to the complex multiplier 214.

: which the complex multiplier 214 receives PN-I and the PN-Q signal from Multipliers 236a and 236b again, respectively, and carries out the multiplication of the two complex inputs according to the following formulas -- [Equation 2]

$$\begin{aligned}(I_{mult} + jQ_{mult}) &= (I_{sum} + jQ_{sum}) \cdot (PN\_I + jPN\_Q) \\ &= (I_{sum} \cdot PN\_I - Q_{sum} \cdot PN\_Q) + j(I_{sum} \cdot PN\_Q + Q_{sum} \cdot PN\_I) \quad , \end{aligned} \tag{2}$$

Imult and Qmult are the outputs from the complex multiplier 214 here, and j is a complex display. Imult and a Qmult signal are supplied to the filters 216a and 216b which filter a signal, respectively. The signal filtered from Filters 216a and 216b is supplied to Multipliers 218a and 218b, respectively, and it carries out the multiplication of the signal by the in phase sine COS (wct) and the right-angle sine SIN (wct), respectively. I modulation and the signal of which Q modulation was done are supplied to the counter 220 which totals a signal in order to offer wave S (t) by which the forward direction was modulated.

[0075]

In an instantiation-example, a data packet is diffused in a long PN code and a short PN code. A long PN code stirs a packet so that only the mobile station 6 as which the packet was determined can carry out the descrambling of the packet. In an instantiation-example, a pilot wave, a power control bit, and a control channel packet are diffused not in a long PN code but in a short PN code so that all the mobile stations 6 may be allowed to receive these bits. The long code generator 232 is generated and long PN sequence is supplied to a multiplexer (MUX) 234. Long PN mask determines offset of long PN sequence, there is and it is assigned to the destination mobile station 6. [one] The output from MUX234 reaches by the data division of transmission, otherwise is long PN sequence throughout zero (for example, period throughout a pilot wave and a power control section). Short PNI and the short PNQ sequence from long PN sequence by which the gate was carried out from MUX234, and the short code generator 238 are supplied to Multipliers 236a and 236b, respectively, and it carries out the multiplication of 2 sets of sequences in order to form PN-I and PN-Q, respectively. PN-I and a PN-Q signal are supplied to the complex multiplier 214.

[0076]

The block diagram of the instantiation-traffic channel shown in drawing 3 and 4 is one of the architecture of a large number which support data coding and the modulation of a forward direction link. Other architecture like the architecture of the forward direction link traffic channel in the CDMA system which suits an IS-95 criterion may be used again, and is within the limits of this invention.

[0077]

In an instantiation-example, the data rate supported by the base station 4 is determined, and the each supported data rate is assigned only to one rate index. The mobile station 6 chooses one of the supported data rates based on C/I measurement. Since to be sent to a base station 4 is required in order to turn to the base station 4 in order that the demanded data rate may transmit data by the demanded data rate, a

trade-off is made between the number of bits needed in order to check the data rate required as the number of the supported data rates. In an instantiation-example, the number of the supported data rates is 7, and it is used in order to check the data rate as which the rate index of a triplet was required. The instantiation-definition of the supported data rate is shown in Table 1. The definition from which the supported data rate differed may be considered carefully, and it is within the limits of this invention.

[0078]

In an instantiation-example, the minimum data rates are 38.4Kbps(es) and the maximum data rates are 2.4576Mbps(es). The minimum data rate is selected based on the C/I measurement in the case of being bad, the processing gain of a system, the design of an error correcting code, and the level of a request of the engine performance rather than it can set to a system. In an instantiation-example, the data rate supported is chosen so that the difference between the supported continuous data rates may be 3dB. 3dB increment is compromise between two or more factors containing the number (or rate of a bit) of bits required in order to transmit the C/I measuring accuracy which may be attained by the mobile station 6, the loss (or inefficient) brought about from quantization of the data rate based on C/I measurement, and the data rate required of the base station 4 from the mobile station 6. Although many bits are required in order that the supported bigger data rate may check the demanded data rate, more efficient use of a forward direction link is permitted for a quantization error smaller than that between the calculated maximum data rate and the supported data rate. This invention is turned to use of other data rates from the data listed by the number and Table 1 of arbitration of a data rate which were supported.

[Table 1] A traffic channel parameter, a notes:16-QAM modulation

パラメタ	データ率							ユニット
	38.4	76.8	153.6	307.2	614.4	1228.8	2457.6	Kbps
データビット/パケット	1024	1024	1024	1024	1024	2048	2048	ビット
パケット長	26.67	13.33	6.67	3.33	1.67	1.67	0.83	msec
スロット/パケット	16	8	4	2	1	1	0.5	スロット
パケット/伝送	1	1	1	1	1	1	2	パケット
スロット/伝送	16	8	4	2	1	1	1	スロット
ウォルシュ記号率	153.6	307.2	614.4	1228.8	2457.6	2457.5	4915.2	Ksps
ウォルシュチャンネル/QPSK位相	1	2	4	8	16	16	16	チャンネル
変調器率	76.8	76.8	76.8	76.8	76.8	76.8	76.8'	ksps
PNチップ/データビット	32	16	8	4	2	1	0.5	チップ/ビット
PNチップ率	1228.8	1228.8	1228.8	1228.8	1228.8	1228.8	1228.8	Kcps
変調フォーマット	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QAM'	
率索引	0	1	2	3	4	5	6	

Drawing of the instantiation-forward direction link frame structure of this invention is shown in drawing 5. traffic channel transmission is divided within a frame -- having -- an instantiation-example -- setting -- the die length of PN sequence with short it -- the same -- or it is defined as 26.67msec(s). Each frame can be accompanied by the control channel information (control channel frame) by which the address was carried out in all the mobile offices 6, and the traffic data (traffic frame) by which the address was carried out in the specific mobile office 6, or may be empty (play frame). The contents of each frame are determined by the schedule performed by the base station 4 currently transmitted. In an instantiation-example, as for each frame, each time amount slot has continuation of 1.667msec(s) for 16 hours including a slot. The time amount slot of 1.667msec(s) is enough to make the mobile station 6 possible

in order to perform C/I measurement of a forward direction link signal. The time amount slot of 1.667msec(s) expresses the amount of time amount sufficient for packet data transmission efficient again. Each time amount slot is divided into four more quarter slots in an instantiation-example.
[0079]
In this invention, each data packet is transmitted [one or the time amount slot beyond it shown in Table 1]. In an instantiation-example, each forward direction link data packet contains 1024 or 2048 bits. It depends on the data rate and range of the rate of 1.2288Mbps, and a higher 1-hour slot for the number of the time amount slots demanded in this way in order to transmit each data packet from a slot for 16 hours of the rate of 38.4Kbps.
[0080]
The instantiation-Fig. of the forward direction link slot structure of this invention is shown in drawing 6 . In an instantiation-example, each slot contains three, four channels by which time-multiplexing was carried out, a traffic channel, a control channel, a pilot channel, and a power control channel. In an instantiation-example, a pilot wave and a power control channel are transmitted within two pilot waves stationed in each time amount slot in the same location, and a power control burst. A pilot wave and a power control burst are described by the detail below.
[0081]
In an instantiation-example, the blowout tea of the packet interleaved from the interleaver 116 is carried out according to a pilot wave and a power control burst. In an instantiation-example, as the interleaved each packet was shown in drawing 8 including 4096 code symbols, the blowout tea of the first 512 code symbols is carried out. The skew of the remaining code symbols is carried out to traffic channel transmission spacing to time amount at a single tier.
[0082]
The code symbol by which blowout tea was carried out is stirred in order to randomize data before applying rectangular Walsh covering. Randomizing restricts an average envelope from the peak of modulated wave S (t). A scrambling sequence may be generated with a straight-line feedback shift register among the approaches learned in the technique. In an instantiation-example, the load of the scrambling machine 122 is carried out to initiation of each slot in the state of LC. In an instantiation-example, although the clock of the scrambling machine 122 synchronizes with the clock of an interleaver 116, it is stopped during a pilot wave and a power control burst.
[0083]
In an instantiation-example, a forward direction Walsh channel is diffused in rectangular cross with 16-bit Walsh covering at the rate of a fixed chip of 1.2288Mbps(es) (a traffic channel and power control channel). The number of the concurrency rectangular cross channels K for every in phase and right-angle signal is a function of a data rate, as shown in Table 1. In an instantiation-example, for a low data rate, in order to make interference to a demodulator phase presumption error into the minimum, an in phase and right-angle Walsh covering are chosen so that a rectangular setup may be carried out. For example, instantiation-Walsh assignment is W8 to W15 about 16 Walsh channels because of W0 to W7, and a right-angle signal because of an in phase signal.
[0084]
In an instantiation-example, a QPSK modulation is used for 1.2288Mbps(es) and a lower data rate. Each Walsh channel contains 1 bit for a QPSK modulation. In an instantiation-example, in the highest data rate of 2.4576Mbps, 16QAM is used and the stirred data are demultiplexed [signal / which are the 2 bit each width of face / 32 parallel current flows and in phase signal] by 16 parallel current flows about 16 parallel current flows and a right-angle signal. In an instantiation-example, LSB of a 2-bit each notation is outputted from an interleaver 116, and it depends, and is an early notation.
It comes out. In an instantiation-example, the map of the QAM modulation input of (0, 1, 3, 2) is carried out to a modulation value [respectively / (+3, +1 -1, -3)]. Use of other modulation systems like m-array phase shift keying PSK is considered carefully, and it is within the limits of this invention.
[0085]
Before becoming irregular in order to maintain the whole fixed transmission power independent of a

data rate, scale doubling of an in phase and the right-angle Walsh channel is carried out. A gain setting is normalized by single reference equivalent to BPSK which is not modulated. The channel gain G which it normalized as a function of the number of the Walsh channels (or data rate) is shown in Table 2. The average power (an in phase or rectangular cross) for every [whose whole normalization power is individually equal] Walsh channel is also listed by Table 2. The channel gain of 16-QAM is **** about cautions for the energy with which it normalized for every Walsh chip explaining [QAM / 1 and 16-] about QPSK the fact of being 5.
[Table 2] Traffic channel rectangular cross channel gain

	パンクチャ持続			
データ率 (Kbps)	ウォルシュチャンネルKの数	変調	ウォルシュチャンネル利得G	チャンネルP_k毎の平均パワー
38.4	1	QPSK	$1/\sqrt{2}$	1/2
76.8	2	QPSK	1/2	1/4
153.6	4	QPSK	$1/2\sqrt{2}$	1/8
307.2	8	QPSK	1/4	1/16
614.4	16	QPSK	$1/4\sqrt{2}$	1/32
1228.8	16	QPSK	$1/4\sqrt{2}$	1/32
2457.6	16	16-QAM	$1/4\sqrt{10}$	1/32

In this invention, in order that a preamble may give the mobile station 6 synchronizing with the slot of the beginning of each rate transmission of adjustable, the blowout tea of it is carried out to each traffic frame. In an instantiation-example, although all preambles are zero sequences and it is diffused in a PN code long about a traffic frame, about a control channel frame, it is not spread in a long PN code. In an instantiation-example, a preamble is BPSK which was diffused in rectangular cross with the Walsh covering W1 and which is not modulated. Use of a signal rectangular cross channel minimizes a peak pair average envelope. Moreover, it is because use of the Walsh covering W1 which is not zero minimum-izes wrong pilot detection, because a pilot wave diffuses it with the Walsh covering W0 about a traffic frame and a preamble does not diffuse it in a long PN code with a pilot wave.
[0086]
A preamble is multiplexed in the style of a traffic channel by initiation of a packet for the continuation which is the function of a data rate. While the die length of a preamble makes possibility of mistake detection min, it is made for a preamble overhead to be abbreviation regularity about all data rates. The sum total of a preamble is shown in Table 3 as a function of a data rate. It is **** about cautions for a preamble containing less than [3.1% or it of a data packet].
[Table 3] Preamble parameter

	プリアンブルバンクチャ持続		
データ率 (Kbps)	ウォルシュ記号	PN チップ	オーバヘッド
38.4	32	512	1.6%
76.8	16	256	1.6%
153.6	8	128	1.6%
307.2	4	64	1.6%
614.4	3	48	2.3%
1228.8	4	64	3.1%
2457.6	2	32	3.1%

(8) Forward direction link traffic frame format Each data packet is format-ized by addition of a frame check bit, a code tail bit, and other control fields in an instantiation-example. In this specification, a octet is defined as 8 information bits, and a data unit is a single octet and contains 8 information bits.
[0087]
In an instantiation-example, a forward direction link supports two data packet formats shown in drawing 9 and 10. In a packet format 410, a packet format 430 includes the nine fields including the five fields. A packet format 410 is used when sufficient data are included, since the data packet which should be transmitted to the mobile station 6 fills all with an available octet completely in the DATA field 418. If there are few amounts of the data which should be transmitted in the DATA field 418 than an available octet, a data packet 430 will be used. All the octets that are not used are packed by zero and shown as the PADDING field 446.
[0088]
In an instantiation-example, the frame-check-sequence (FCS) fields 412 and 432 contain the CRC parity bit generated by the CRC generator 112 (refer to drawing 3) according to the generator polynomial of a schedule. In an instantiation-example, although a CRC polynomial is $g(x) = x16+x12+x5+1$, other polynomials may be used and it is within the limits of this invention. In an instantiation-example, a CRC bit is calculated about FMT, SEQ, LEN, DATA, and the PADDING field. This offers error detection about all bits except for the code tail bit in the TAIL fields 420 and 448 transmitted in the traffic channel top of a forward direction link. A CRC bit is calculated by only the DATA field in an alternative example. In an instantiation-example, although the FCS fields 412 and 432 contain the CRC parity bit of 16, other CRC generators which offer a different number of parity bits may be used, and they are within the limits of this invention. Although the FCS fields 412 and 432 of this invention were described in relation to the CRC parity bit, other frame check sequence may be used and they are within the limits of this invention. For example, the check sum total is calculated for a packet and may be supplied to the FCS field.
[0089]
In an instantiation-example, the frame format (FMT) fields 414 and 434 contain one control bit which shows whether a data frame contains a data octet (packet format 410) or data, padding and zero, or the message beyond it (packet format 430). In an instantiation-example, the low value of the FMT field 414 corresponds to a packet format 410. Instead, the high value of the FMT field 434 corresponds to a packet format 430.

[0090]
The number (SEQ) fields 416 and 442 of sequences identify the data unit of the beginning of data fields 418 and 444, respectively. The number of sequences permits that data are transmitted to the mobile station 6 outside a sequence, for example, re-transmission of the packet received by the error. Assignment of the number of sequences in data unit level removes the need for the frame fragmentation protocol of re-transmission. As for the number of sequences, the mobile station 6 permits detecting a duplicate data unit again. The mobile office 6 can determine that the data unit was received by each time amount slot without use of a special signal message by reception of FMT, SEQ, and LEN. It depends for the number of the bits assigned since the number of sequences was expressed on the maximum number of the data unit which may be transmitted by the data re-transmission lag one time amount slot and when worse. In an instantiation-example, each data unit is identified with the number of 24 bit sequences. In a 2.4576Mbps data rate, the maximum number of the data unit which may be transmitted by each slot is abbreviation 256. Eight bits are required in order to identify each of a data unit. Furthermore, it may be calculated that the data re-transmission lag in the case of being worse is smaller than 500msec(s). A re-transmission lag includes time amount required for the re-transmission attempt caused by re-transmission of data, and burst error activation in the case of being worse for the NACK message by the mobile station 6. So, it permits identifying appropriately 24 bits of data units by which the mobile station 6 was received without obscurity. The number of bits of the SEQ fields 416 and 442 can be fluctuated depending on the size and the re-transmission lag of the DATA field 418. Use of the number of bits from which the SEQ fields 416 and 442 differ is within the limits of this invention.
[0091]
When it has transmission data to the mobile station 6 with few base stations 4 than the available space of the DATA field 418, a packet format 430 is used. A packet format 430 permits that a base station 4 transmits the data unit of the number of arbitration to the mobile station 6 to the maximum number of an available data unit. In an instantiation-example, it is shown that, as for the high value of the FMT field 434, the base station 4 is transmitting the packet format 430. Within a packet format 430, the LEN field 440 includes a number of a data unit of values currently transmitted by the packet. In an instantiation-example, since the DATA field 444 can arrange from 0 to 255, the LEN field 440 is 8 bits in die length.
[0092]
The DATA fields 418 and 444 contain the data which should be transmitted to the mobile station 6. In an instantiation-example, each data packet contains 1024 bits whose 992 is a data bit about a packet format 410. However, since a variable-length data packet increases the number which is an information bit, it may be used, and it is within the limits of this invention. The size of the DATA field 444 is determined by the LEN field 440 about a packet format 430.
[0093]
In an instantiation-example, a packet format 430 may be used in order to transmit zero or the signal message beyond it. The signal die-length (SIG LEN) field 436 contains the die length of the following signal message by the octet. In an instantiation-example, the SIG LEN field 436 is 8 bit length. The SIGNALING field 438 contains a signal message. an instantiation-example -- setting -- each signal message -- the message identification (MESSAGE ID) field -- message length -- the field (LEN) and a message activation load which is described below are included.
[0094]
It is set [in / including a padding octet / in the PADDING field 446 / an instantiation-example] as 0x00 (hex). The PADDING field 446 is used by the reason referred to as that a base station 4 may have a transmission data octet to mobile stations 6 fewer than the number of available octets in the DATA field 418. At the time of this octet, the PADDING field 446 contains sufficient padding OKUTEKKU, in order to fill the data field which is not used. The PADDING field 446 is variable length and it depends for it on the die length of the DATA field 444.
[0095]
The fields of the last of packet formats 410 and 430 are the TAIL fields 420 and 448, respectively. The TAIL fields 420 and 448 contain the zero (0x0) code tail bit used in order to **** an encoder 114 (refer

to drawing 3) in the condition of having been known in the end of each data packet. A code tail bit permits that an encoder 114 classifies a packet briefly so that only the bit from one packet may be used for a coding process. As for a code tail bit, the decoder in the mobile station 6 permits determining the packet boundary in a decode process again. It depends for the number of bits of the TAIL fields 420 and 448 on the design of an encoder 114. In an instantiation-example, the TAIL fields 420 and 448 are long enough for ****(ing) in the condition that the encoder 114 was known.
[0096]
The two above-mentioned packet formats are instantiation-formats which may be used in order to make transmission of data and a signal message easy. It may be created so that other various packet formats may suit use of specific communication system. Moreover, communication system may be designed so that it may be further adapted from two packet formats mentioned above.
(9) Forward direction link control channel frame In this invention, in order that a traffic channel may transmit a message to the mobile station 6 from a base station 4 again, it is used. The mold of the message transmitted contains ACK or the NACK message the short data packet for :** hand off prompting message, ** paging message (for example, call the specific mobile station 6 which has data in the queue for the mobile station 6), and the mobile station 6 of ** specification, and for ** hard flow link data transmission (described here later). The message of other molds may be transmitted on a control channel again, and is within the limits of this invention. Completion of a call setting phase For a paging message supervise [the mobile station 6 / a control channel], it begins to transmit a hard flow link pilot signal.
[0097]
In an instantiation-example, as shown in drawing 5 , time-multiplexing of the control channel is carried out to a traffic channel with traffic data. The mobile station 6 identifies a control message by detecting the preamble similarly covered by the PN code of a schedule. In an instantiation-example, a control message is transmitted at the rate of immobilization determined by the mobile station 6 during acquisition. In a desirable example, the data rates of a control channel are 76.8Kbps(es).
[0098]
A control channel transmits a message by the control channel capsule. Drawing of an instantiation-control channel capsule is shown in drawing 11. In an instantiation-example, each capsule contains a preamble 462, a control activation load, and the CRC parity bit 474. Including one or the message beyond it, if a control activation load is required, it contains the padding bit 472. each message -- message identification (MSG ID) 464 -- message length -- 466 (LEN), the alternative address (ADDR) 468 (supposing a message is turned to the specific mobile station 6), and the message activation load 470 are included. In an instantiation-example, a message aligns on a octet boundary. The instantiation-control channel capsule shown in drawing 11 contains one message turned to two broadcast messages and the specific mobile office 6 which were meant in all the mobile offices 6. MSG ID field 464 determines whether a message requires an address field (for example, is it broadcast or a specific message or not?).
(10) Forward direction link pilot channel It is the pilot signal with which a forward direction link pilot channel is used by the mobile station 6 in this invention for the first acquisition, phase recovery, time amount recovery, and rate association.
It provides. These use resembles it of the CDMA communication system which suits an IS-95 criterion. In an instantiation-example, a pilot signal is used by the mobile station 6, in order to perform C/I measurement again.
[0099]
The instantiation-block diagram of the forward direction link pilot channel of this invention is shown in drawing 3 . pilot data are supplied to a multiplier 156 -- the sequence of zero (or wholly 1) is included altogether. A multiplier 156 covers pilot data in Walsh code W0. Since the Walsh code W0 is the sequence of zero altogether, the output of a multiplier 156 is pilot data. Time-multiplexing of the pilot data is carried out by MUX162, and they are supplied to I Walsh channel diffused in short PNI code within the complex multiplier 214 (refer to drawing 4). In an instantiation-example, since pilot data

permit reception by all the mobile stations 6, they are not diffused in the long PN code which has the gate closed by MUX234 during a pilot burst. A pilot signal is a BPSK signal which is not modulated in this way.

[0100]

Drawing showing a pilot signal is shown in drawing 6 . In an instantiation-example, each time amount slot includes two pilot bursts 306a and 306b which take place to the edge of the 1st and 3rd quadrants of a time amount slot. In an instantiation-example, each pilot burst 306 is 64 chips in continuation (Tp=64 chip). In the absence of traffic data or control channel data, a base station 4 transmits only the pilot wave who has brought about the discontinuous wave burst at the rate of a period of 1200Hz, and a power control burst. A pilot modulation parameter is made into Table 4 on a chart.

(11) Hard flow link power control In this invention, a forward direction link power control channel is used in order to send the power control instruction used in order to control the transmission power of hard flow link transmission from a remote station 6. The mobile station 6 currently each transmitted by the hard flow link acts as a source of active jamming to all other mobile stations 6 in a network. In order to make active jamming of a hard flow link into the minimum and to make capacity into the maximum, the transmission power of each mobile station 6 is controlled by two power control loops. In the instantiation-example, the power control loop resembles it of the CDMA system described by the detail U.S. patent No.5,056,109 entitled "the approach and equipment" for controlling the transmission power in a CDMA cellular mobile telephone system which were transferred to the grantee of this invention and incorporated here as bibliography. Other power control mechanisms are considered carefully again, and are within the limits of this invention.

[0101]

The 1st power control loop adjusts the transmission power of the mobile station 6 so that the quality of a hard flow link signal may be maintained by setting level. The quality of a signal is measured as energy pair noise plus active jamming ratio Eb/I0 the whole bit of the hard flow link received in the base station 4.

Setting level is quoted as Eb/I0 set point. The 2nd power control loop adjusts a set point where level [**** / engine performance which is measured by the frame error rate (FER)] is maintained. Since the transmission power of each mobile station 6 is active jamming at other mobile stations 6 of communication system, power control is critical to a hard flow link. Making hard flow link transmission power into the minimum decreases active jamming, and it increases hard flow link capacity.

[0102]

Within the 1st power control loop, Eb/I0 of a hard flow link signal is measured in a base station 4. A base station 4 compares with a set point Eb/I0 measured from it. If measured Eb/I0 is larger than a set point, a base station 4 will transmit a power control message so that transmission power may be decreased to the mobile station 6. Instead, if measured Eb/I0 is below a set point, a base station 4 transmits a power control message so that transmission power may be increased to the mobile station 6. In an instantiation-example, a power control message is carried out by one power control bit. In an instantiation-example, it orders for the high value of a power control bit to increase the transmission power to the mobile station 6, and orders for a low value to decrease the transmission power to the mobile station 6.

[0103]

In this invention, the power control bit of each base station 4 and all the mobile stations 6 in a communication link is transmitted by the power control channel. In an instantiation-example, a power control channel is included to 32 rectangular cross channels diffused with 16-bit Walsh covering. Each Walsh channel transmits one hard flow power control (RPC) bit or one FAC bit at periodic spacing. Each activity mobile station 6 can assign the RPC index which defines Walsh covering and a QPSK modulation phase (for example, an in phase or a right angle) about transmission of the RPC bit style planned for the mobile station 6. In an instantiation-example, the RPC index of 0 is held for a FAC bit.

[0104]

The instantiation-block diagram of a power control channel is shown in drawing 3 . A RPC bit is

supplied to the notation repeater 150 which repeats the **** RPC bit of the schedule of time amount. The repeated RPC bit is supplied to the Walsh covering element 152 which covers a bit with Walsh covering corresponding to a RPC index. The covered bit is supplied to the gain element 154 which carries out scale doubling of the bit in advance of a modulation so that fixed whole transmission power may be maintained. In an instantiation-example, the gain of a RPC Walsh channel is normalized so that equally to the whole transmission power with the whole available RPC channel power. The gain of the Walsh channel may change as a function of time amount for efficient use of the whole base station transmission power, while maintaining reliable RPC transmission to all the active mobile stations 6. In an instantiation-example, the Walsh channel gain of the mobile station 6 which is not active is set as zero. Automatic power control of a RPC Walsh channel can use presumption of the nature measurement of a forward direction link from the DRC channel which corresponds from the mobile station 6. The RPC bit by which scale doubling was carried out from the gain element 154 is supplied to MUX162.

[0105]

In an instantiation-example, the RPC index of 0 to 15 is assigned to W15 from the Walsh covering W0, respectively, and the 1st pilot burst (RPC burst 304 of drawing 7) is transmitted to a perimeter within a slot. The RPC index of 16-31 is assigned W15 from the Walsh covering W0, respectively, and the 2nd pilot burst (RPC burst 308 of drawing 7) is transmitted to a perimeter within a slot. Setting in the instantiation-example, a RPC bit is an in phase signal.

A BPSK modulation is carried out with odd number Walsh covering (for example, W1, W3, W5 grade) modulated by even number Walsh covering (for example, W0, W2, W4 grade) and the right-angle signal which were boiled and modulated. In order to decrease a peak pair average envelope, it is desirable to balance an in phase and right-angle power. Furthermore, in order to minimize crosstalk by the recovery phase presumption error, it is desirable to assign rectangular covering to an in phase and a right-angle signal.

[0106]

In an instantiation-example, even 31RPC bit may be transmitted to 31RPC Walsh channel by each time amount slot. In an instantiation-example, 15RPC bit is transmitted by the slot of the 1st one half, and 16RPC bit is transmitted by the slot of the 2nd one half. It is combined by the counter 212 (refer to drawing 4), and a RPC bit includes the wave of a power control channel as shown in drawing 7 .

[0107]

The timing chart of a power control channel is shown in drawing 6 . In an instantiation-example, the rate of a RPC bit is 600bps or one RPC bit per time amount slot. Time-multiplexing of each RPC bit is carried out, and as shown in drawing 6 and 7, it is transmitted on two RPC bursts (for example, RPC bursts 304a and 304b). In an instantiation-example, each RPC burst is 32PN chip (namely, 2 Walsh notations) as width of face (Tpc=32 chip), and the width of face of each whole RPC bit is 64PN chip (namely, 4 Walsh notations). Other rates of a RPC bit may be obtained by changing the number of notation iteration. For example, the rates of a RPC bit of 1200bps are the RPC bursts 304a and 304b about 31RPC bit of the 1st set (in order to support to coincidence to the 63 mobile station 6, or since a power control factor is increased), and may be obtained by transmitting 32RPC bit of the 2nd set by the RPC bursts 308a and 308b. In this case, all Walsh coverings are used for an in phase and a right-angle signal. The modulation parameter of a RPC bit is summarized in Table 4.

[Table 4] A pilot wave and a power control modulation parameter

パラメタ	RPC	FAC	パイロット	ユニット
率	600	75	1200	Hz
変調フォーマット	QPSK	QPSK	BPSK	
制御ビットの持続	64	1024	64	PN チップ
繰返し	4	64	4	記号

Since there are few each base stations 4 and mobile stations 6 in a communication link than the number of available RPC Walsh channels, a power control channel has an explosive special feature. In this condition, a certain RPC Walsh channel is set as zero by suitable accommodation of the gain of the gain element 154.

[0108]

In an instantiation-example, a RPC bit is transmitted to the mobile station 6, without coding and interleaving, in order to minimum-ize processing delay. Furthermore, since an error may be corrected by the following time amount slot by the power control loop, the reception which the power control bit mistook is not harmful to the data telecommunication system of this invention.

[0109]

In this invention, the mobile station 6 may be in many base stations 4 and software hand offs in a hard flow link. The approach and equipment of hard flow link power control of the mobile station 6 in a software hand off are indicated by the above-mentioned U.S. patent No.5,056,109. The mobile station 6 in a software hand off supervises the RPC Walsh channel of each base station 4 in an active group, and combines a RPC bit according to the approach indicated by the above-mentioned U.S. patent No.5,056,109. In the 1st example, the mobile station 6 performs logic OR of a descent power instruction. If it orders the mobile station 6 that any one of the received RPC bits decreases transmission power, the mobile station 6 will decrease transmission power. In the 2nd example, the mobile office 6 in a software hand off can combine the software judging of a RPC bit, before accomplishing a hard judging. Other examples which process the received RPC bit may be considered carefully, and it is within the limits of this invention.

[0110]

In this invention, a FAC bit displays whether probably the traffic channel of the constituted pilot channel is transmitting with the frame of the next one half on the mobile station 6. Use of a FAC bit improves a data rate demand C/I presumption by the mobile station 6, and by so broadcasting the knowledge of active jamming activities. In an instantiation-example, a FAC bit changes only on a half frame boundary, and is repeated by eight continuous time amount slots which brings about the rate of a bit of 75bps. A list indication of the parameter of a FAC bit is given in Table 4.

[0111]

: to which the mobile station 6 can calculate C/I measurement as follows by use of a FAC bit --
[Equation 3]

$$\left(\frac{C}{I}\right)_i = \frac{C_i}{I - \sum_{j \neq i}(1-\alpha_j)C_j}, \qquad (3)$$

i (C/I) is C/I measurement of the i-th forward direction link signal here. Ci is the power by which the i-th whole forward direction link signal was received. Cj is the power by which the j-th forward direction link signal was received, I is whole active jamming when supposing that all the base stations 4 are transmitting, and alphaj is the FAC bit of the j-th forward direction link signal, and may be 0 or 1 depending on a FAC bit.

(12) Hard flow link data transmission In this invention, a hard flow link supports the rate data transmission of adjustable. It permits that the rate of adjustable offers flexibility and transmits it by one of two or more of the data rates depending on the amount of the data with which the mobile station 6 should be transmitted to a base station 4. In an instantiation-example, the mobile station 6 can transmit data to the time amount of arbitration by the lowest data rate. In an instantiation-example, the data transmission in a higher data rate needs authorization by the base station 4. This activation makes a hard flow link transmission lag the minimum, while offering efficient use of a hard flow link resource.

[0112]

The instantiation-Fig. of the flow chart of the hard flow link data transmission of this invention is shown in drawing 16. In order to establish the DCH of the latest rate to a hard flow link with block 802, as described by the above-mentioned U.S. patent No.5,289,527, the mobile station 6 is Slot n first, and performs an access probe. In the same slot n, a base station 4 restores to an access probe, and receives an access message with block 804. Since a base station 4 is a DCH, a demand is permitted, and authorization and the assigned RPC index of a control channel are transmitted with block 806 by the slot n+2. By the slot n+2, the mobile station 6 receives authorization, and power is controlled by the base station 4 with block 808. The mobile station 6 starts transmission of a pilot signal, and has the direct access to the lowest DCH of a hard flow link at the beginning of a slot n+3.

[0113]

If the mobile station 6 has traffic data and the DCH of a high rate is required, the mobile station 6 can start a demand with block 810. In a slot n+3, a base station 4 receives a high-speed-data demand with block 812. In a slot n+5, a base station 4 transmits authorization to a control channel with block 814. In a slot n+5, the mobile station 6 receives authorization with block 816, and starts high-speed-data transmission with block 818 to the hard flow link started in a slot n+6.

(13) Hard flow link architecture In the data telecommunication system of this invention, hard flow link transmissions differ from forward direction link transmission by some approaches. In a forward direction link, data transmission happens from one base station 4 to one mobile station 6 typically. However, in a hard flow link, each base station 4 can receive data transmission from many mobile stations 6 to coincidence. In an instantiation-example, each mobile station 6 can be transmitted by one of two or more of the data rates depending on the amount of the data which should be transmitted to a base station 4. This system design reflects the unsymmetrical property of data communication.

[0114]

In an instantiation-example, the hourly base unit of a hard flow link is the same as that of the hourly base unit of a forward direction link. In an instantiation-example, a forward direction link and hard flow link data transmission happen on the time amount slot which is 1.667msec continuation. However, since the data transmission on a hard flow link happens by the typical more low data rate, it may be used in

order that a longer hourly base unit may improve effectiveness.

[0115]

In an instantiation-example, a hard flow link supports two a channel:pilot wave / DRC channels, and a DCH. The function and activation of each of these channels are described below. A pilot wave / DRC channel is used in order to transmit a pilot signal and a DRC message, and a DCH is used in order to transmit traffic data.

[0116]

Drawing of the instantiation-hard flow link frame structure of this invention is shown in drawing 14. In the instantiation-example, hard flow link frame structure resembles the forward direction phosphorus claim structure shown in drawing 5 . However, in a hard flow link, a pilot wave / DRC data, and traffic data are transmitted to an in phase and a right-angle channel at coincidence.

[0117]

In an instantiation-example, the mobile station 6 always transmits a DRC message to a pilot wave / DRC channel by each time amount slot, when the mobile station 6 has received high-speed-data transmission. Instead, when the mobile station 6 has not received high-speed-data transmission, a series of slots of a pilot wave / DRC channel include a pilot signal. A pilot signal is used by the receiving base station 4 as assistance of acquisition of :beginning as a pilot wave / DRC, the phase criteria of a DCH, and a source of closed-loop hard flow link power control for some functions.

[0118]

The bandwidth of a hard flow link is chosen as 1.2288MHz in an instantiation-example. This bandwidth permits use of the hardware of existing designed for the CDMA system which suits an IS-95 criterion. However, since the bandwidth of ** increases capacity, and/or since a system demand is suited, it may be used. In an instantiation-example, since [those / in which the same long PN code short PNI, and the PNQ code diffuse a hard flow link signal like] it was specified according to the IS-95 criterion, it is used. In an instantiation-example, a hard flow link channel is transmitted using a QPSK modulation. Instead, a QPSK modulation may be used in order to minimize peak pair mean amplitude change of the modulating signal which may bring about the improved engine performance. A different system bandwidth, a PN code, and the attempt of a modulation may be considered carefully, and it is within the limits of this invention.

[0119]

In an instantiation-example, the transmission power of hard flow link transmission on a pilot wave / DRC channel, and a DCH is maintained in Eb/I0 set point of a schedule where Eb/I0 of a hard flow link signal which is measured in a base station 4 was described by the above-mentioned U.S. patent No.5,506,109. Power control is maintained by the mobile station 6 and the base station 4 in a communication link, and an instruction is transmitted as a RPC bit, as mentioned above.

(14) Hard flow link DCH The block diagram of the instantiation-hard flow link architecture of this invention is shown in drawing 13. Data are classified into a data packet and supplied to an encoder 612. About each data packet, an encoder 612 generates a CRC parity bit, inserts a code tail bit, and encodes data. In an instantiation-example, an encoder 612 encodes a packet according to the coding format described by the above-mentioned U.S. patent application No.08/743,688. Other coding formats may be used again and are within the limits of this invention. The packet encoded from the encoder 612 is supplied to the block interleaver 614 which re-sets a code symbol in order within a packet. The interleaved packet is supplied to the multiplier 616 which supplies the data which covered data and were covered with Walsh covering to the gain element 618. The gain element 618 carries out scale doubling of the data in order to maintain fixed energy per bit Eb unrelated to a data rate. The data by which scale doubling was carried out from the gain element 618 are supplied to the multipliers 650b and 650d which diffuse data in PN-Q and a PN-I sequence, respectively. The data diffused from Multipliers 650b and 650d are supplied to the filters 652b and 652d which filter data, respectively. The signal filtered from Filters 652a and 652b is supplied to counter 654a, and the signal filtered from Filters 652c and 652d is supplied to counter 654b. A counter 654 totals the signal from a DCH, and the signal from a pilot wave / DRC channel. The output of Counters 654a and 654b contains IOUT and QOUT which are modulated

by the in phase sine COS (Wct) and the right-angle sine SIN (Wct) (as a forward direction link), and are totaled, respectively (not shown in drawing 13), respectively. In an instantiation-example, traffic data are transmitted by both the in phase of a sine, and the quadrature phase.

[0120]

In an instantiation-example, data are diffused in a long PN code and a short PN code. A long PN code stirs data so that the mobile station 6 which the received base station 4 is transmitting can be identified. A short PN code diffuses the signal of a system bandwidth. The long code generator 642 is generated and long PN sequence is supplied to a multiplier 646. Short PNI and a short PNQ sequence are supplied to the multipliers 646a and 646b which carry out the multiplication of 2 sets of sequences, respectively in order to generate the short code generator 644 and to form PN-I and a PN-Q signal, respectively. Timing / control circuit 640 offers timing criteria.

[0121]

The instantiation-block diagram of DCH architecture as shown in drawing 13 is one of much the architecture which supports data coding and the modulation of a hard flow link. As for architecture, it of a forward direction link use multiplex rectangular cross channel is like being used again for high data transmission. Other architecture like the architecture of the hard flow link traffic channel in the CDMA system which suits an IS-95 criterion may be considered carefully again, and is within the limits of this invention.

[0122]

In an instantiation-example, a hard flow link DCH supports four data rates tabulated by Table 5. An additional data rate and/or a different data rate may be supported, and it is within the limits of this invention. In an instantiation-example, as shown in Table 5, it depends for the packet size of a hard flow link on a data rate. As described by U.S. patent application No.08/743,688 mentioned above, the improved decoder engine performance may be obtained for a larger packet size. It may be used in order that a packet size which is different in this way from these which were displayed on Table 5 may improve the engine performance, and it is within the limits of this invention. In addition, a packet size may be made from the parameter independent of a data rate.

[Table 5] A pilot wave and a power control modulation parameter

パラメタ	データ率				ユニット
	9.6	19.2	38.4	76.8	Kbps
フレーム持続	26.66	26.66	13.33	13.33	msec
データパケット長	245	491	491	1003	ビット
CRC長	16	16	16	16	ビット
コード末尾ビット	5	5	5	5	ビット
全ビット/パケット	256	512	512	1024	ビット
符号化パケット長	1024	2048	2048	4096	記号
ウォルシュ記号長	32	16	8	4	チップ
必要な要求	ノー	イエス	イエス	イエス	

As shown in Table 5, a hard flow link supports two or more data rates. In an instantiation-example, the lowest data rate of 9.6Kbps is assigned to registration top each mobile station 6 in a base station 4. In an instantiation-example, the mobile station 6 can transmit data to the DCH of the lowest rate by the time

amount slot of arbitration, without needing the authorization from a base station 4. Transmission by the higher data rate is permitted in an instantiation-example by the selected base station 4 which put the foundation on the system parameter of a lot like the throughput of a system load, justice, and the whole. The instantiation-scheduling device of high-speed-data transmission is described by the detail the above-mentioned U.S. patent application No.08/798,951.
(15) A hard flow link pilot wave / DRC channel The instantiation-block diagram of a pilot wave / DRC channel is shown in drawing 13. A DRC message is supplied to the DRC encoder 626 which encodes a message according to the coding format of a schedule. Since it has effect with the wrong forward direction link data rate decision strong against the system throughput engine performance, coding of a DRC message is important because of the need of making possibility of the error of a DRC message low enough. In an instantiation-example, the DRC encoder 626 is a rate (8 4) CRC block encoder which encodes a triplet DRC message into 8 bit-code words. The encoded DRC message is supplied to the multiplier 628 which covers a message in Walsh code which has only one and identifies the destination base station 4 to which a DRC message is turned. The Walsh code is supplied by the Walsh generator 624. The covered DRC message is supplied to the multiplier (MUX) 630 which carries out the multiplication of the message to pilot data. A DRC message and pilot data are supplied to the multipliers 650a and 650c which diffuse data by PN-I and the PN-Q signal, respectively. In this way, a pilot wave and a DRC message are transmitted by both the in phase of a sine, and the quadrature phase.
[0123]
In an instantiation-example, a DRC message is transmitted to the selected base station 4. This is attained by covering a DRC message in Walsh code which identifies the selected base station 4. In an instantiation-example, the Walsh code is 128 chip length. The origin of a 128 chip WORUSHU code is known in the technique. The one only Walsh code is assigned to the mobile station 6 and each base station 4 in a communication link. Each base station 4 decovers the signal of a DRC channel in the assigned Walsh code. The selected base station 4 can decover a DRC message, and transmits data to the mobile office 6 which answered it and is demanded by the forward direction link.
Since the Walsh code from which these base stations 4 differ can be assigned, other base stations 4 can determine that the demanded data rate is not turned to them.
[0124]
In an instantiation-example, in order to identify a base station 4 which is the same as for the short PN code of a hard flow link, and is different about all the base stations 4 in a data telecommunication system, there is no offset in short PN sequence. The data telecommunication system of this invention supports a software hand off on a hard flow link. As for use of the same short PN code without offset, it permits that many base stations 4 receive the same hard flow link transmission from the mobile station 6 among a software hand off. Although a short PN code offers SUPEKUTORARU diffusion, discernment of a base station 4 is not permitted.
[0125]
In an instantiation-example, a DRC message carries the data rate demanded by the mobile station 6. In an instantiation-example, a DRC message carries the display of the quality (for example, C/I information which was measured by the mobile station 6) of a forward direction link. From the base station 4 beyond one or it, the mobile station 6 can receive a forward direction link pilot signal to coincidence, and performs C / I measurement of the each received pilot signal. The mobile station 6 chooses from it the best base station 4 based on the parameter of the lot which can be compared with current, and pre- C / I measurement. Rate control information is format-ized in the DRC message which may be told in one of two or more of the examples to a base station 4.
[0126]
In the 1st example, the mobile station 6 transmits a DRC message based on the demanded data rate. The demanded data rate is a data rate by which the highest which produces the satisfactory engine performance in C/I measured by the mobile station 6 was supported. From C/I measurement, the mobile station 6 calculates the maximum data rate which produces the satisfactory engine performance first. One supported data rate quantizes from it, and the maximum data rate is specified as a demanded data

rate. It is transmitted to the base station 4 where the data rate index corresponding to the demanded data rate was chosen. The instantiation group of the supported data rate and a corresponding data rate index are shown in Table 1.

[0127]

In the 2nd example, the mobile station 6 transmits the display of the quality of a forward direction link to the selected base station 4, and the mobile station 6 transmits C / I index showing the value by which C/I measurement was quantized. The map of the C/I measurement may be carried out to a table, and it unites with a C/I index. Since a C/I index is expressed, using many bits permits finer quantization of C/I measurement.

Moreover, carrying out a map is made to a straight line, or it may be distorted beforehand. About straight-line mapping, each increment in a C/I index expresses the corresponding increment in C/I measurement. For example, the increment in 2.0dB of C/I measurement of each phase of a C/I index can be expressed. About mapping which was able to be distorted beforehand, each increment in a C/I index can express a different increment in C/I measurement. As an example, mapping which was able to be distorted beforehand may be used in order to quantize C/I measurement so that it may agree on the cumulative-distribution-function (CDF) curve of C/I distribution as shown in drawing 18.

[0128]

Other examples which tell rate control information from the mobile station 6 to a base station 4 are considered carefully, and are within the limits of this invention. Furthermore, use of a number of bits which are different since rate control information is expressed is within the limits of this invention again. It lets many specifications pass, and for simplification, this invention is described in the environment of the 1st example which uses a DRC message in order to tell the demanded data rate.

[0129]

In an instantiation-example, C / I measurement may be performed with a forward direction link pilot signal by the approach similar to it which is used for a CDMA system. The approach and equipment which perform C / I measurement are described by U.S. patent application No.08/722,763 entitled "the approach and equipment" of the September 27, 1996 application which was transferred to the grantee of this invention and incorporated here as bibliography which measure the quality of a link in spectrum diffusion communication system. An epitome may obtain C/I measurement of a pilot signal by dediffusing the signal received by the short PN code. Supposing a channel condition changes between the times of C/I measurement and actual data transmission, C/I measurement of a pilot signal contains inaccuracy. In this invention, use of a FAC bit permits that the mobile station 6 takes in forward direction link activities to consideration, when determining the demanded data rate.

[0130]

In an alternative example, C / I measurement may be performed by the forward direction link traffic channel. A traffic channel signal is first dediffused in a long PN code and a short PN code, and is decovered in Walsh code. Since the larger percentage of the transmitted power is assigned to data transmission, C/I measurement of the signal of a DCH is more exact, and is obtained. The forward direction link signal received by the mobile station 6

Other approaches of measuring ** C/I may be considered carefully again, and are within the limits of this invention.

[0131]

In an instantiation-example, a DRC message is transmitted in the one half which a time amount slot (refer to drawing 14) begins. A DRC message is 1024 chips or 0.83msec(s) of a time amount slot because of instantiation-time amount slot 1.667msec. It contains. The 1024 remaining chips of time amount are used by the base station 4 in order to restore to it and decode a message. Transmission of the DRC message in a part with an early time amount slot permits transmitting data probably by the data rate as which the base station 4 was required in the time amount slot which decodes a DRC message and continues immediately within the same time amount slot. Short processing delay permits that the communication system of this invention is promptly adapted for change of an operating environment.

[0132]

In an alternative example, the demanded data rate is told by use of absolute criteria and relative criteria to a base station 4. In this example, absolute criteria including the demanded data rate are transmitted periodically. It permits that absolute criteria determine the exact data rate as which the base station 4 was required by the mobile station 6. The relative criteria the data rate as which the time amount slot from which the mobile station 6 happens closely was required indicates it to be whether it is it is higher than the data rate as which the front time amount slot was required, or low, or the same for each time amount slot during transmission of absolute criteria are transmitted to a base station 4. The mobile station 6 transmits absolute criteria periodically. It permits securing that the reception in which it was set as the condition that the demanded data rate was known, and relative criteria made a mistake does not accumulate periodic transmission of a data rate index. Use of absolute criteria and relative criteria can decrease the baud transmission rate of the DRC message to the mobile station 6. Other protocols for transmitting the demanded data rate are considered carefully, and it is within the limits of this invention. (16) Hard flow link access channel Among a registration phase, a access channel is used by the mobile station 6, in order to transmit a message to a base station 4. In an instantiation-example, a access channel is performed using the configuration which has each slot accessed at random by the mobile station 6 and by which the slot was carried out. In an instantiation-example, time-multiplexing of the access channel is carried out to a DRC channel.

[0133]

In an instantiation-example, a access channel transmits a message in a access channel capsule. In an instantiation-example, the access channel frame format is the same as that of what was specified according to the IS-95 criterion except for being 26.67msec(s) instead of 20msec frame as which timing was specified according to the IS-95 criterion. Drawing of an instantiation-access channel capsule is shown in drawing 15. In an instantiation-example, each access channel capsule 712 contains 722 or 1 preamble or the message capsule 724 beyond it, and the padding bit 726. Each message capsule 724 contains the message die-length (MSG LEN) field 732, the message body 734, and the CRC parity bit 736.

(17) Hard flow link NACK channel In this invention, the mobile station 6 transmits a NACK message to a DCH. A NACK message is generated as each packet received by the mobile station 6 by the error. In an instantiation-example, a NACK message may be transmitted using a blank and a burst signal data format, as described by U.S. patent No.5,504,773 mentioned above.

[0134]

Although this invention was described by the context of a NACK protocol, use of an ACK protocol may be considered carefully and is within the limits of this invention.

[0135]

The above-mentioned description of a desirable example was offered so that it might make it possible to make or use this invention for any persons who became skillful in the technique. Various deformation over these examples is already clear to those who became skillful in the technique, and the fundamental principle defined here may be applied to other examples, without using the capacity of invention. In this way, this invention should be ****(ed) by the largest range that agreed with the principle and the new description which being limited to the example shown here was not meant and were indicated here.

[Brief Description of the Drawings]

[Drawing 1]

It is drawing of the data telecommunication system of this invention containing two or more cel, two or more base stations, and two or more mobile stations.

[Drawing 2]

It is the instantiation-block diagram of the subsystem of the data telecommunication system of this invention.

[Drawing 3]

It is the block diagram of the instantiation-forward direction link architecture of this invention.

[Drawing 4]

It is the block diagram of the instantiation-forward direction link architecture of this invention.

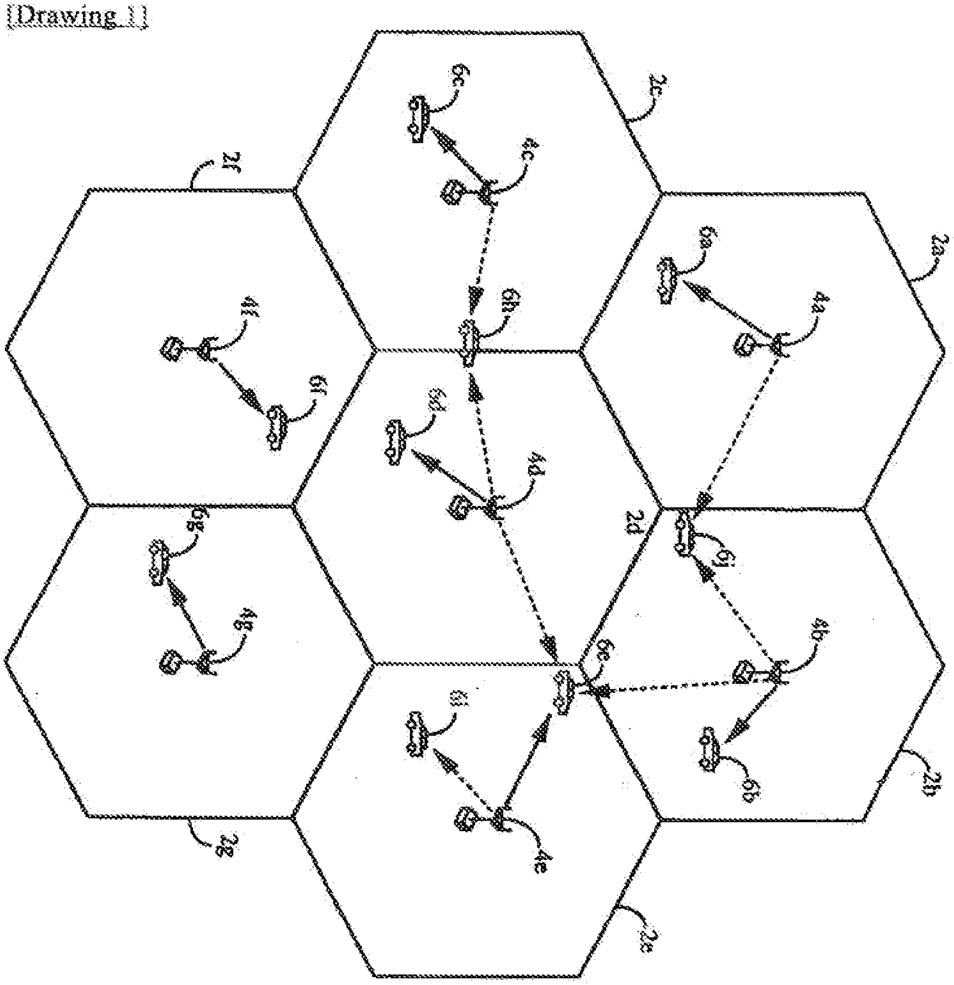
[Drawing 5]
It is drawing of the instantiation-forward direction link frame structure of this invention.
[Drawing 6]
It is drawing of an instantiation-forward direction traffic channel and a power control channel.
[Drawing 7]
It is drawing of an instantiation-forward direction traffic channel and a power control channel.
[Drawing 8]
It is drawing of a packet where the blowout tea of this invention was carried out.
[Drawing 9]
It is drawing of two instantiation-data packet formats and control channel capsules.
[Drawing 10]
It is drawing of two instantiation-data packet formats and control channel capsules.
[Drawing 11]
It is drawing of two instantiation-data packet formats and control channel capsules.
[Drawing 12]
It is the instantiation-timing chart showing the high packet transmission of a forward direction link.
[Drawing 13]
It is the block diagram of the instantiation-hard flow link architecture of this invention.
[Drawing 14]
It is drawing of the instantiation-hard flow link frame structure of this invention.
[Drawing 15]
It is drawing of an instantiation-hard flow link connection channel.
[Drawing 16]
It is the instantiation-timing chart showing the high data transmission of a hard flow link.
[Drawing 17]
It is the instantiation-state diagram showing the shift between the operational status of the versatility of a mobile station.
[Drawing 18]
It is drawing of the cumulative distribution function (CDF) of the C/I distribution in ideal 6 square-shape cellular layout.
[Description of Notations]
4 [-- Selector element,] -- A base station, 6 -- A mobile station, 10 -- A base station controller, 14 16 -- A cel control processor, 20 -- The source of data, 24 -- Packet network interface, 40 -- A data queue, 42 -- A channel element, 48 -- Channel scheduler, 50 [-- Decoder,] -- A forward direction link, 52 -- A hard flow link, 64 -- A demodulator, 66 68 [-- Controller,] -- A data sink, 72 -- An encoder, 74 -- A modulator, 76 112 -- A CRC encoder, 114 -- An encoder, 116 -- Interleaver, 118 -- A frame blowout tea element, 120 -- A multiplier, 122 -- Scrambling machine, 130 -- 132 The rate controller of adjustable, 152 -- 134 A Walsh covering element, 154 -- Gain element, 160 162 -- A multiplexer, 212 -- A counter, 214 -- Complex multiplier, 216 -- 218 A filter, 236 -- A multiplier, 232 -- A long code generator, 238 -- 304 A short code generator, 308 -- A burst, 306 -- Pilot wave, 410 430 -- A data packet format, 462 -- Preamble, 612 -- An encoder, 614 -- A block interleaver, 616, 628, 646, 650 -- Multiplier, 618 [-- A timing control circuit, 642 / -- A long code generator, 644 / -- A short code generator, 652 / -- A filter, 654 / -- A counter, 712 / -- Access channel capsule.] -- A gain element, 624 -- The Walsh generator, 626 -- A DRC encoder, 640

[Translation done.]

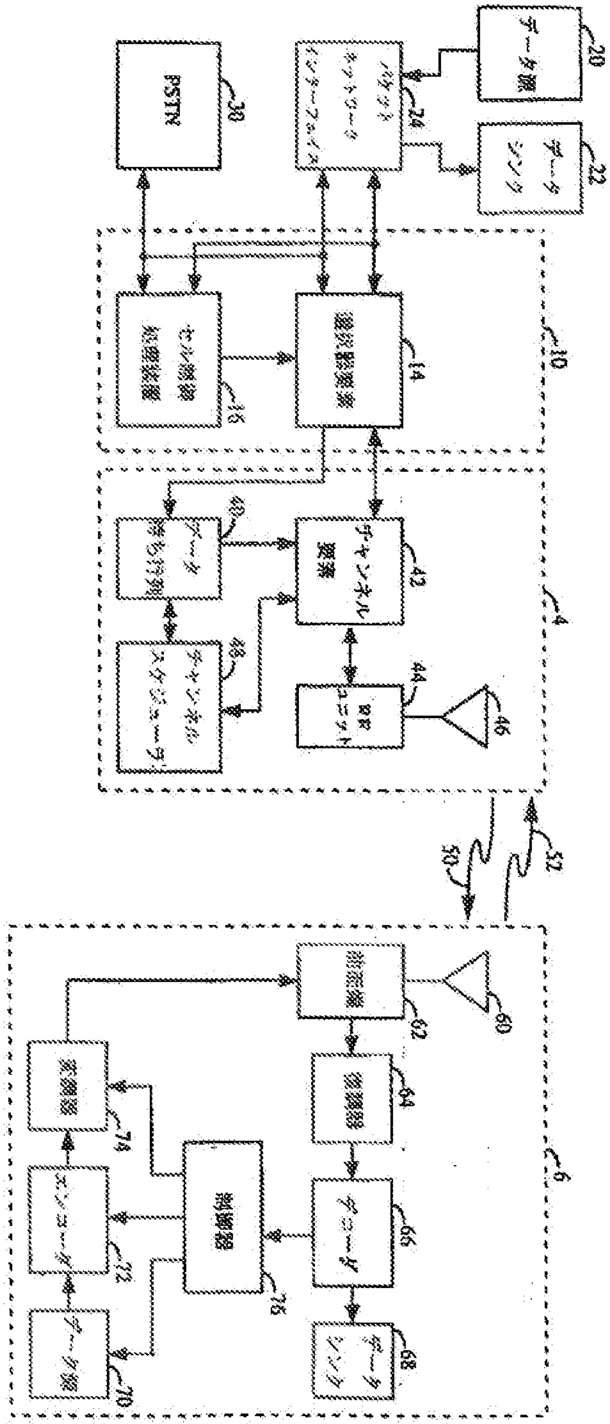
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

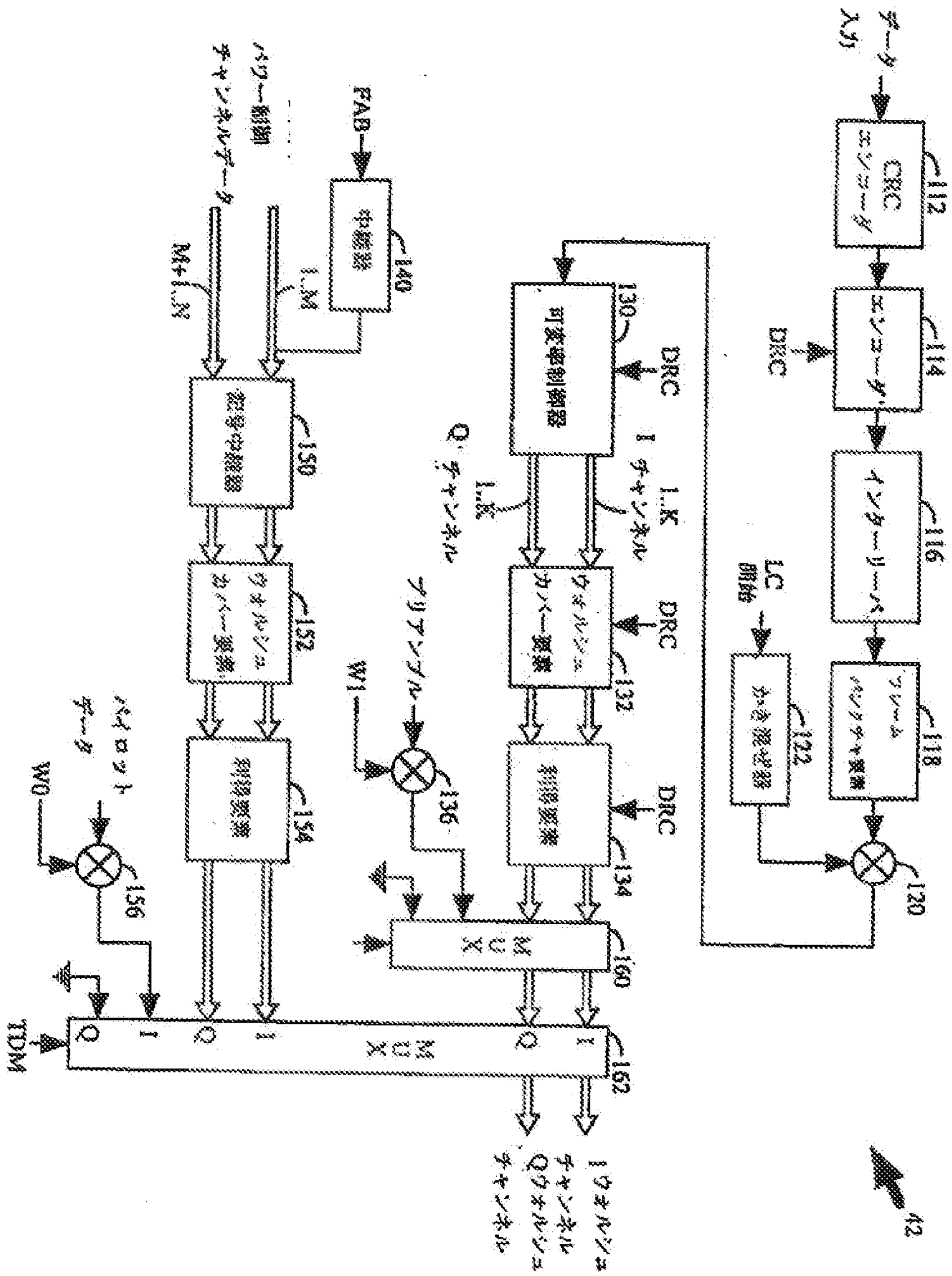
[Drawing 1]



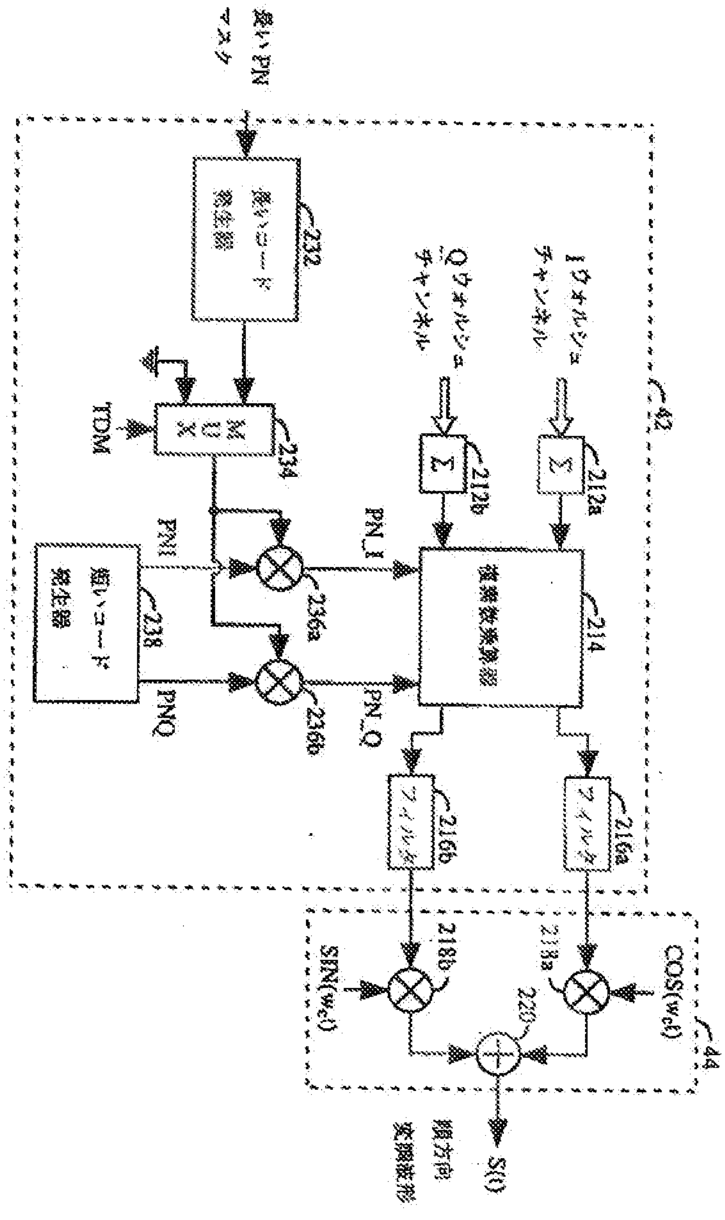
[Drawing 2]


PSTN
30
24
20
22
10
16
14
40
42
4
48
44
46
50
52
60
62
64
66
68
70
72
74
76
6
データ源
データシンク
パケットネットワークインタフェイス
チャンネル素子
チャンネルスケジューラ
RFユニット
エンコーダ
デコーダ
データ待ち行列

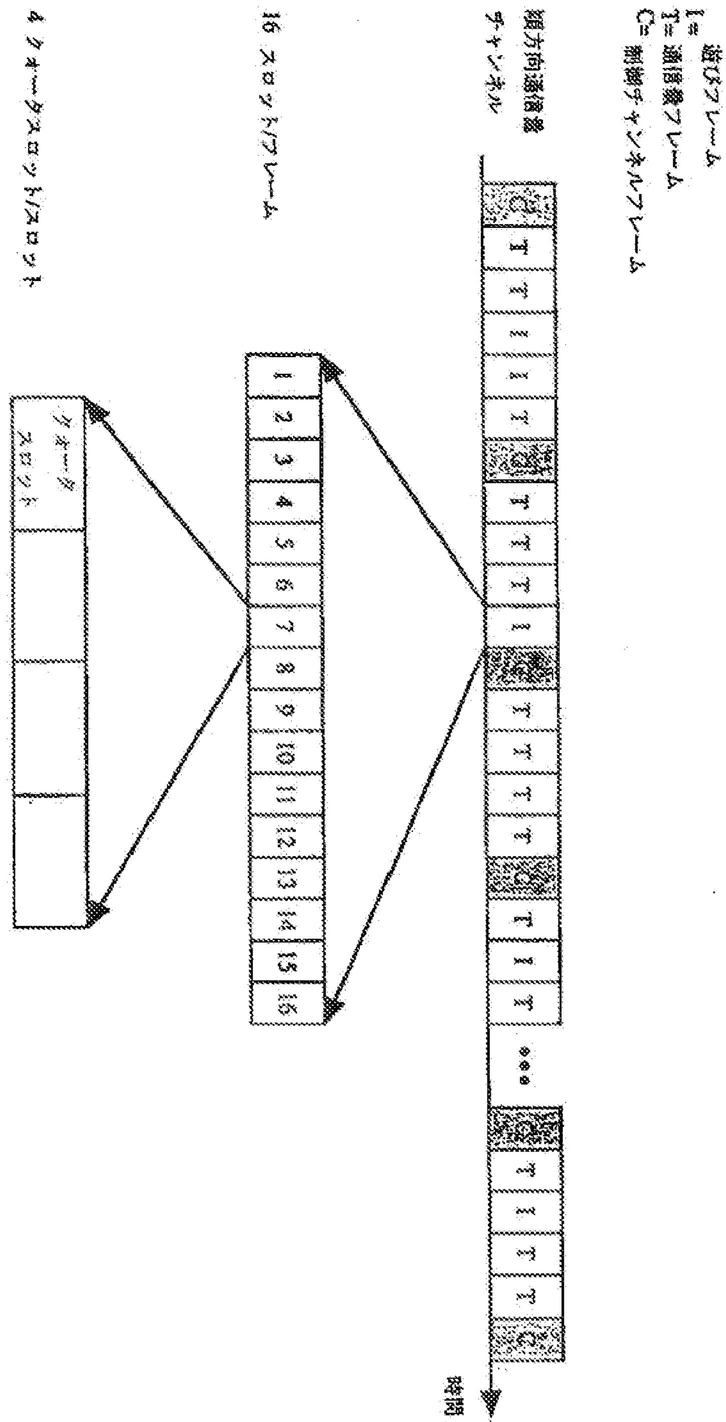
[Drawing 3]


CRC
DRC
FAB
TDM
W0
W1
MUX
112
114
116
118
120
122
130
132
134
136
140
150
152
154
156
160
162
42

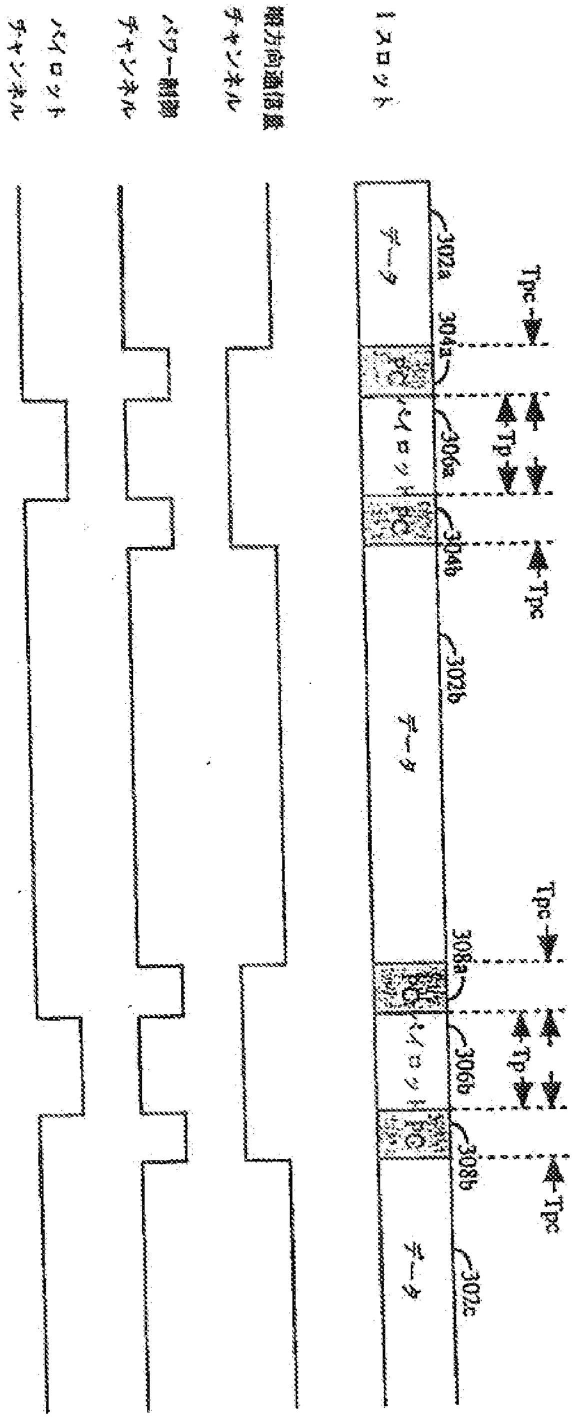
[Drawing 4]


長いPN
マスク
長いコード
発生器
232
MUX
234
TDM
短いコード
発生器
238
PNI
PNQ
236a
236b
PN_I
PN_Q
Qウォルシュ
チャンネル
Iウォルシュ
チャンネル
Σ
212b
Σ
212a
複素乗算器
214
42
フィルタ
216b
フィルタ
216a
218b
218a
SIN(w_c t)
COS(w_c t)
220
44
S(t)
順方向
変調波形

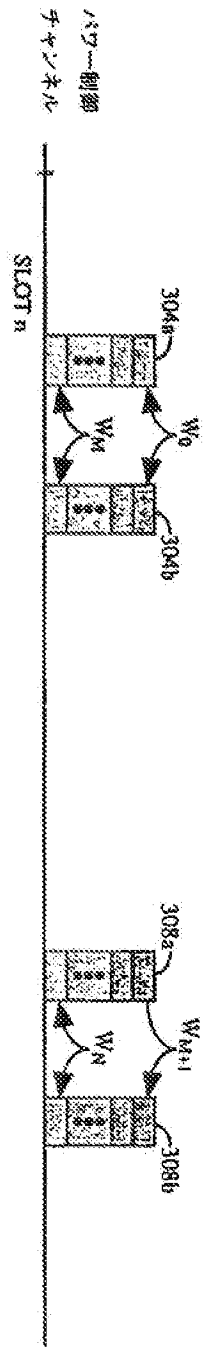
[Drawing 5]



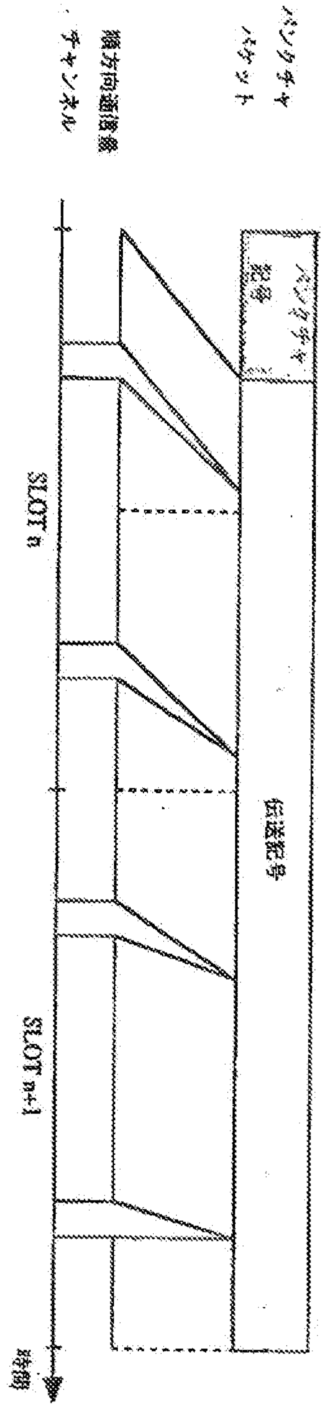
[Drawing 6]


1スロット
パワー制御チャンネル
パイロットチャンネル
データ
PC
パイロット
302a
304a
306a
304b
302b
308a
306b
308b
302c
Tpc
Tp

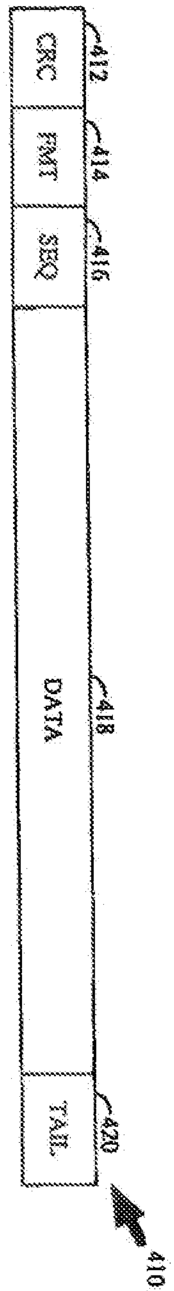
[Drawing 7]



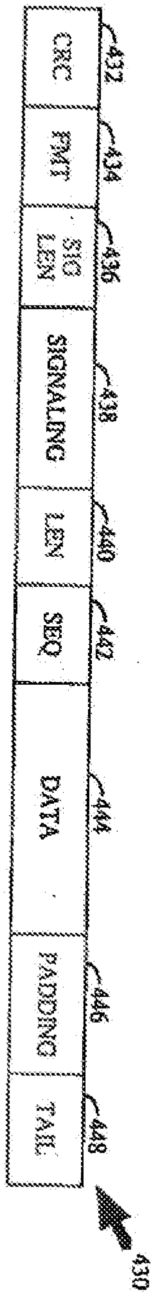
[Drawing 8]



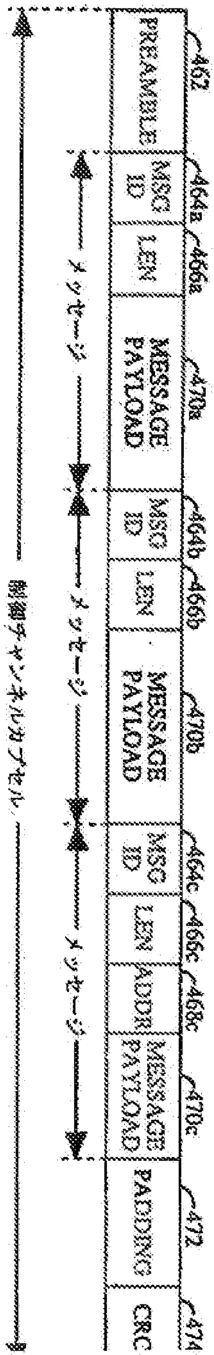
[Drawing 9]



[Drawing 10]

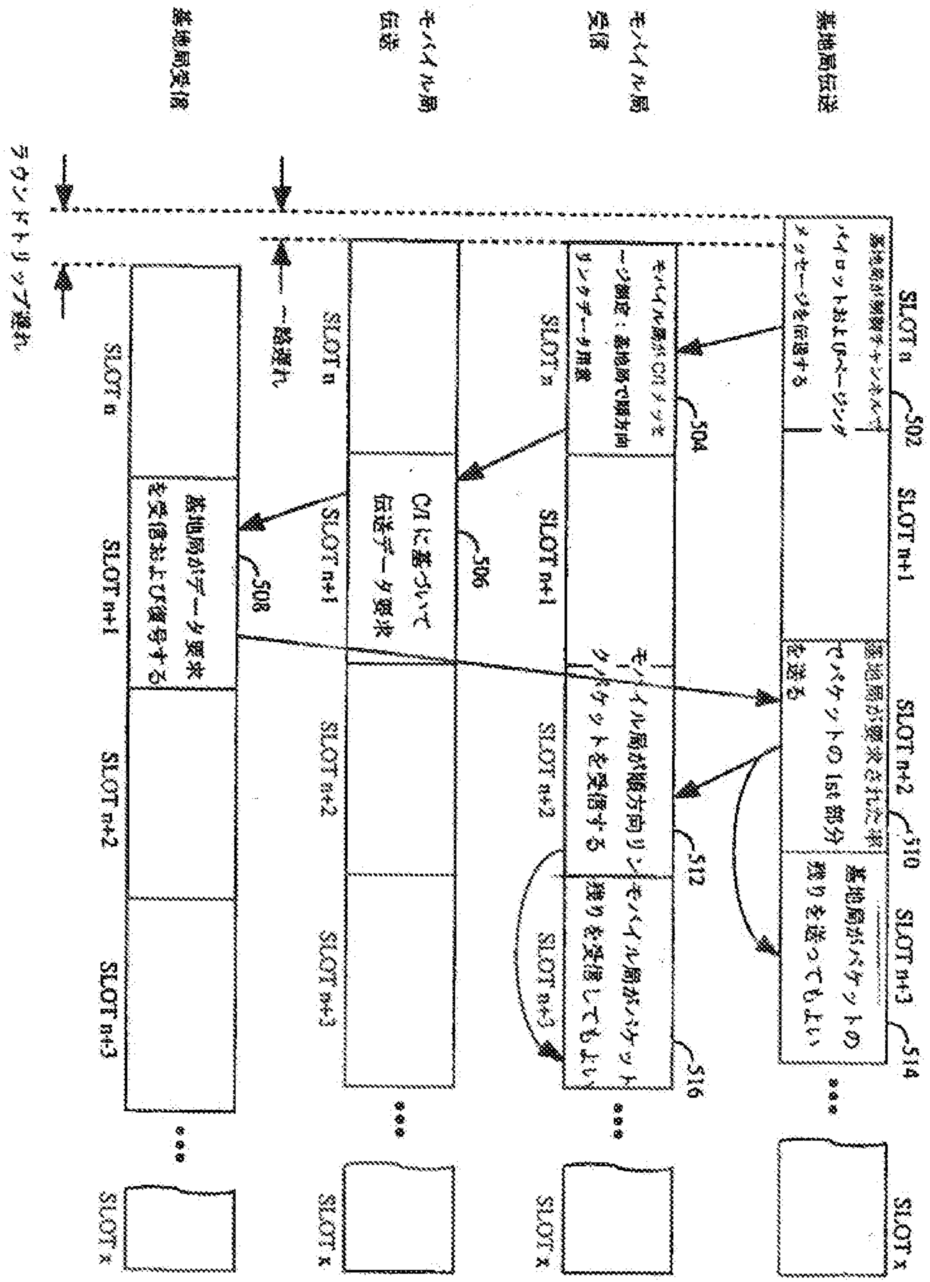

CRC
432
FMT
434
SIG LEN
436
SIGNALING
438
LEN
440
SEQ
442
DATA
444
PADDING
446
TAIL
448
430

[Drawing 11]

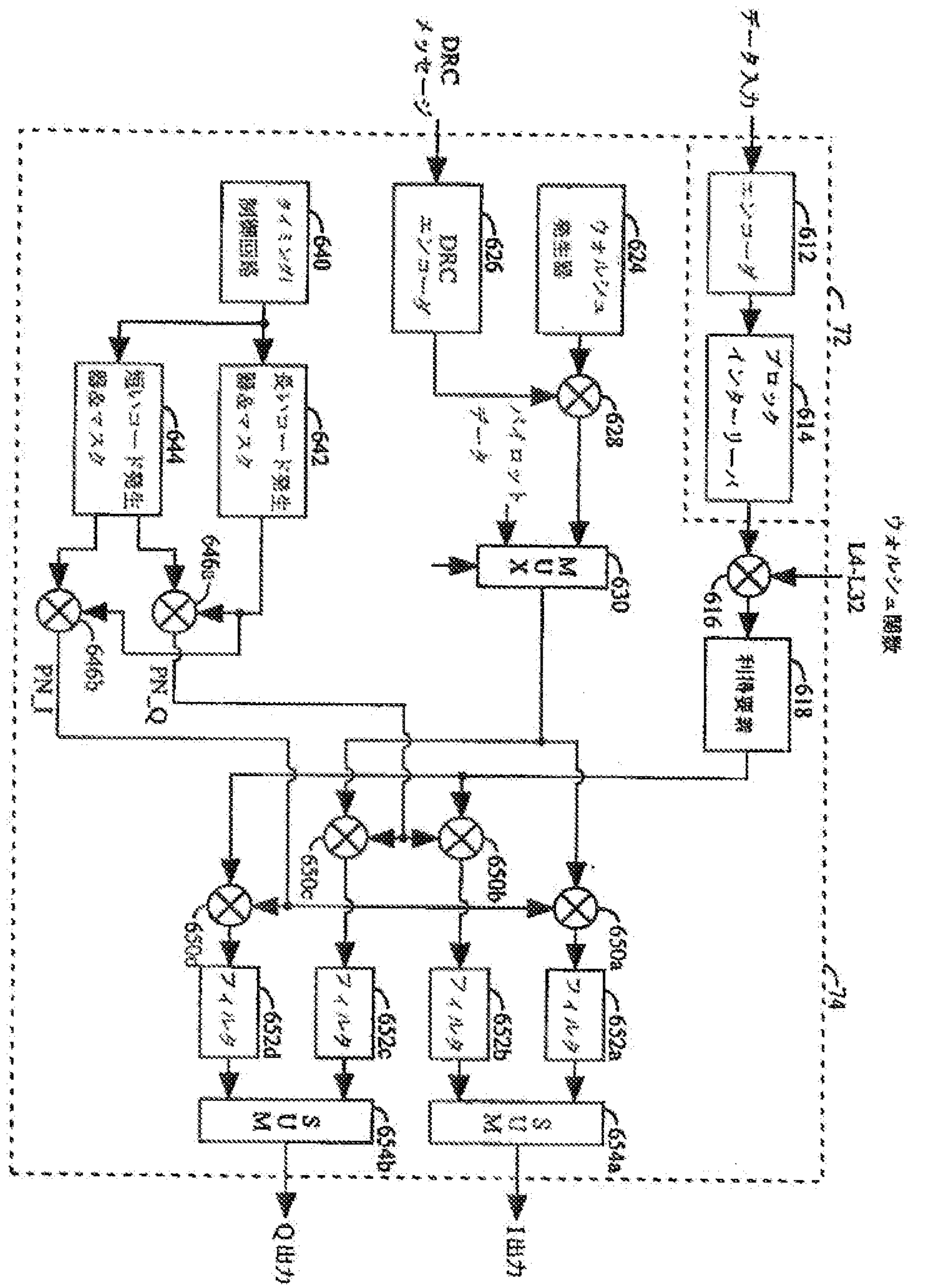


PREAMBLE
462
MSG ID
464a
LEN
466a
MESSAGE PAYLOAD
470a
メッセージ
MSG ID
464b
LEN
466b
MESSAGE PAYLOAD
470b
メッセージ
MSG ID
464c
LEN
466c
ADDR
468c
MESSAGE PAYLOAD
470c
メッセージ
PADDING
472
CRC
474
制御チャンネルカプセル

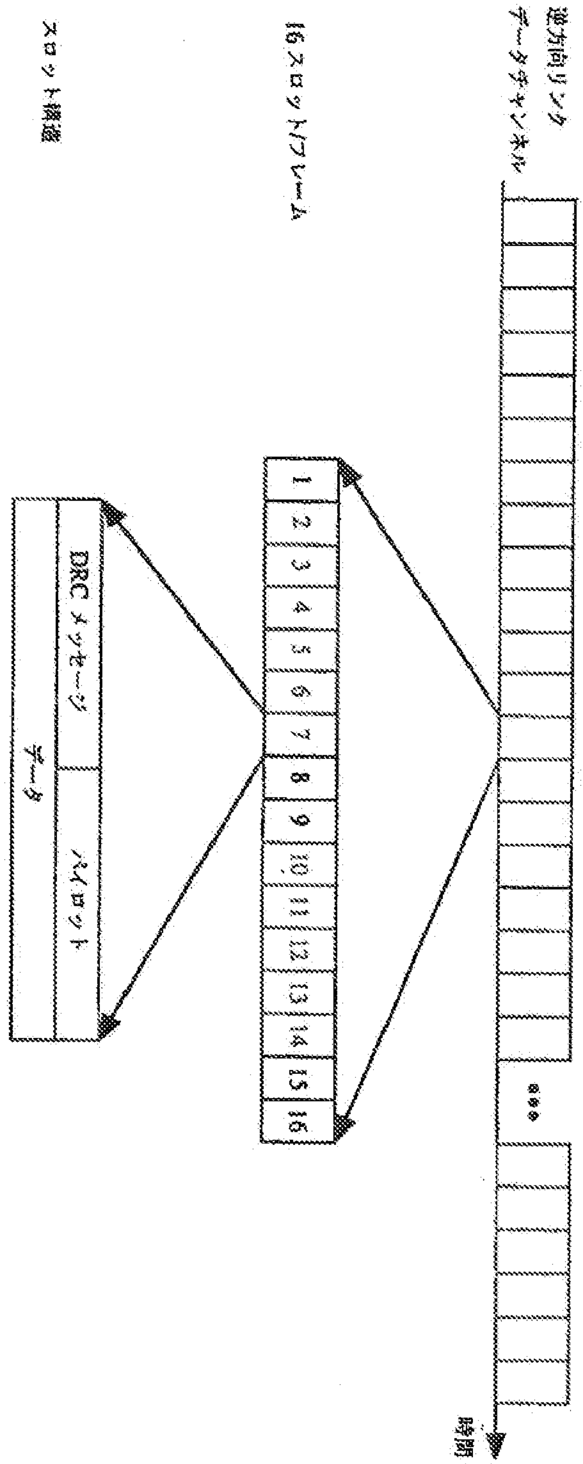
[Drawing 12]


基地局伝送
モバイル局受信
モバイル局伝送
基地局受信
SLOT n
SLOT n+1
SLOT n+2
SLOT n+3
SLOT x
502
504
506
508
510
512
514
516
CIに基づいて伝送データ要求
基地局がデータ要求を受信および復号する
基地局が要求されたパケットの1st部分を送る
基地局がパケットの残りを送ってもよい
モバイル局が順方向リンクパケットを受信する
モバイル局がパケット残りを受信してもよい
一路遅れ
ラウンドトリップ遅れ

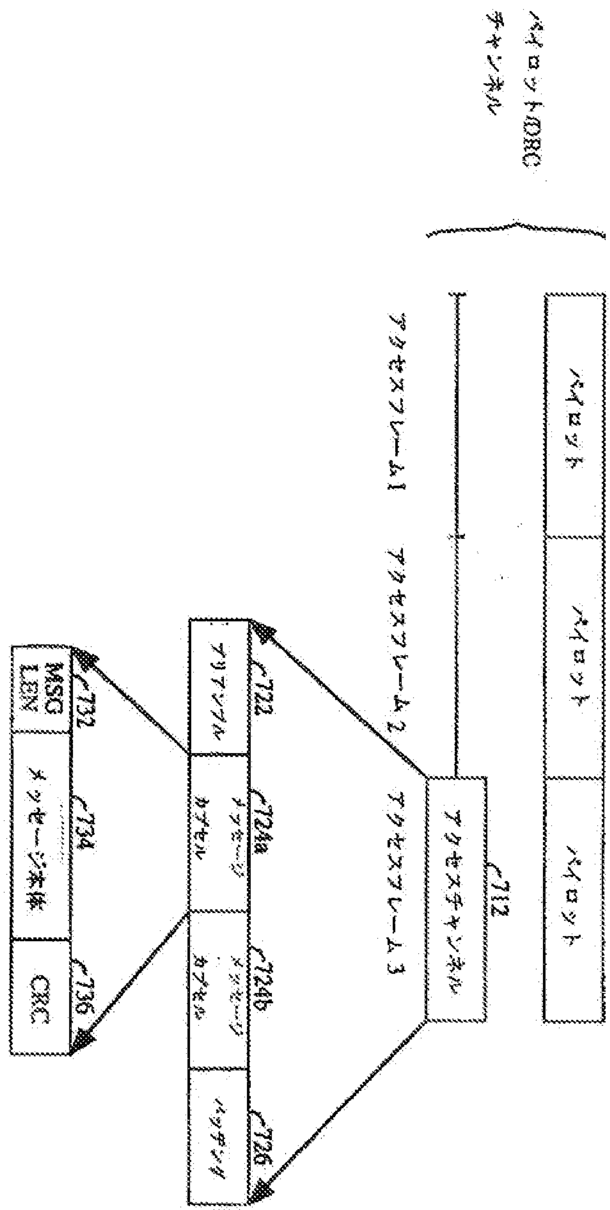
[Drawing 13]


データ入力
DRC
メッセージ
72
612
エンコーダ
614
ブロック
インターリーバ
ウォルシュ関数
L4-L32
616
618
利得要素
624
ウォルシュ
発生器
626
DRC
エンコーダ
628
パイロット
データ
630
MUX
640
タイミング
制御回路
642
長いコード発生
器及びマスク
644
短いコード発生
器及びマスク
646a
646b
PN_Q
PN_I
650a
650b
650c
650d
652a
652b
652c
652d
フィルタ
654a
654b
SUM
74
I出力
Q出力

[Drawing 14]

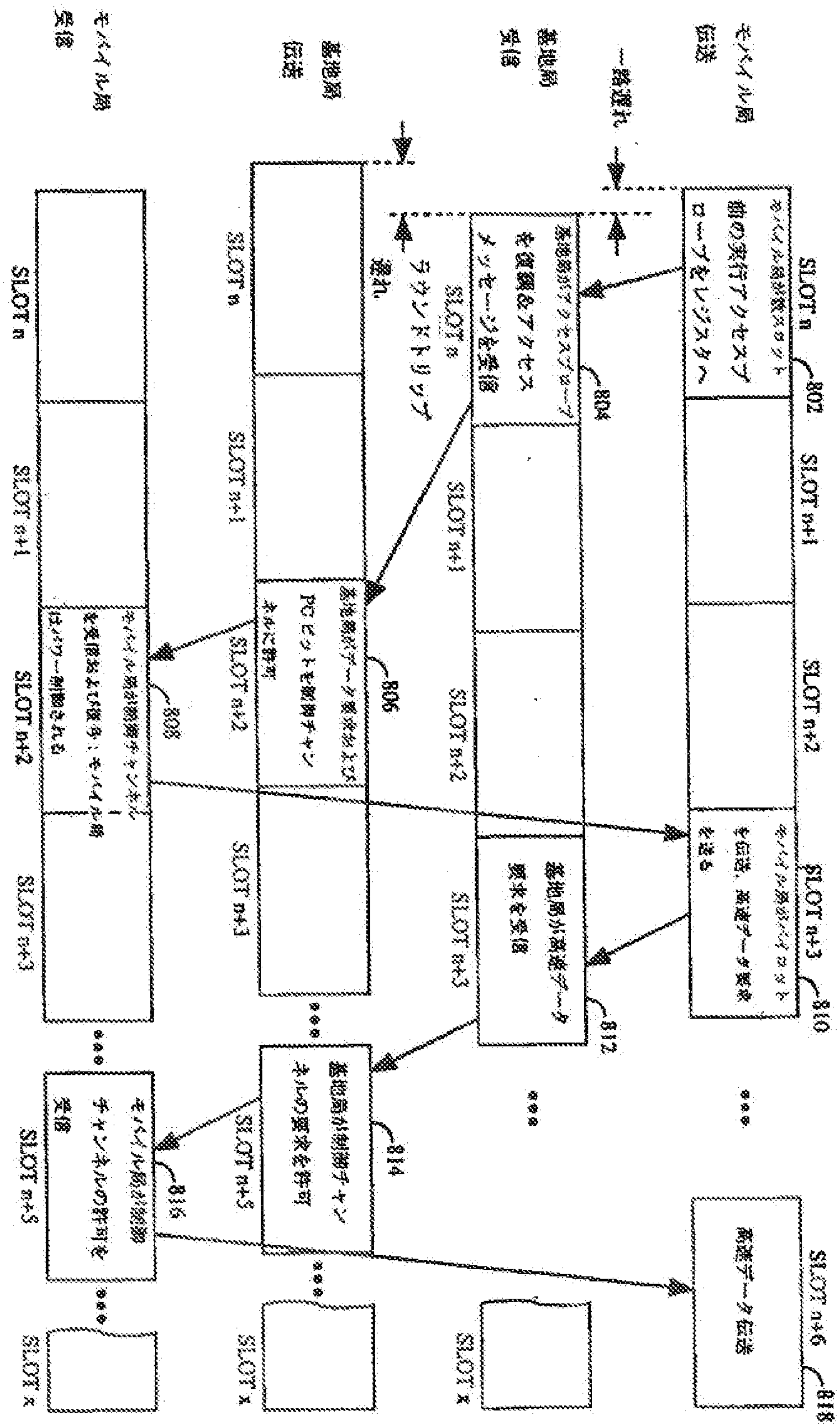

逆方向リンク
データチャンネル
16スロット/フレーム
スロット構造
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
DRC メッセージ
パイロット
データ
時間

[Drawing 15]

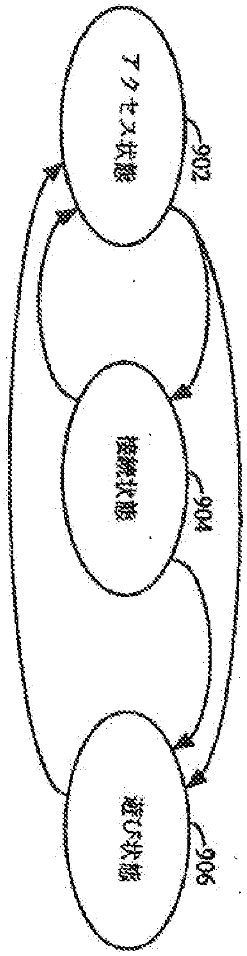


パイロットDRC
チャンネル
パイロット
パイロット
パイロット
アクセスフレーム1
アクセスフレーム2
アクセスフレーム3
アクセスチャンネル
712
プリアンブル
722
メッセージカプセル
724a
メッセージカプセル
724b
パッディング
726
MSG LEN
732
メッセージ本体
734
CRC
736

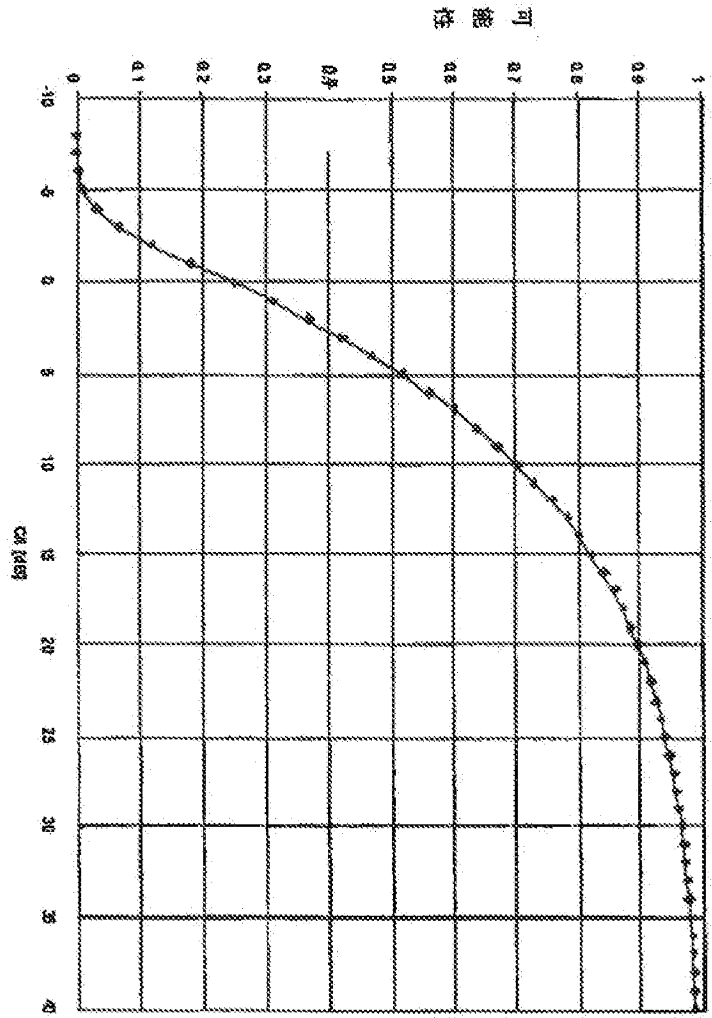
[Drawing 16]


モバイル局 伝送
一路遅れ
基地局 受信
基地局 伝送
モバイル局 受信
SLOT n
SLOT n+1
SLOT n+2
SLOT n+3
SLOT n+5
SLOT n+6
SLOT x
802
モバイル局が次スロット前の実行アクセスプローブをレジスタへ
804
基地局がアクセスプローブを復調＆アクセスメッセージを受信
ラウンドトリップ遅れ
806
基地局がデータ要求およびPCビットを制御チャンネルに許可
808
モバイル局が制御チャンネルを受信および場合：モバイル局はパワー制御される
810
モバイル局がパイロットを伝送、高速データ要求を送る
812
基地局が高速データ要求を受信
814
基地局が制御チャンネルの要求を許可
816
モバイル局が制御チャンネルの許可を受信
818
高速データ伝送

[Drawing 17]



[Drawing 18]



[Translation done.]